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APPENDIX NUMBER XII.

SCHOOL-HOUSES.

I. COMMON ERRORS IN SCHOOL ARCHITECTURE.

Under this head it will be sufficient to enumerate the principal features of school-houses as they are.

They are, almost universally, badly located, exposed to the noise, dust and danger of the highway, unattractive, if not positively repulsive in their external and internal appearance, and built at the least possible expense of material and labor.

They are too small. There is no separate entry for boys and girls appropriately fitted up; no sufficient space for the convenient seating and necessary movements of the scholars; no platform, desk, or recitation room for the teacher.

They are badly lighted. The windows are inserted on three or four sides of the room, without blinds or curtains to prevent the inconvenience and danger from cross-lights, and the excess of light falling directly on the eyes or reflected from the book, and the distracting influence of passing objects and events out of doors.

They are not properly ventilated. The purity of the atmosphere is not preserved by providing for the escape of such portions of the air as have become offensive and poisonous by the process of breathing, and by the matter which is constantly escaping from the lungs in vapor, and from the surface of the body in insensible perspiration.

They are imperfectly warmed. The rush of cold air through cracks and defects in the doors, windows, floor and plastering is not guarded against. The air which is heated is already impure from having been breathed, and made more so by noxious gases arising from the burning of floating particles of vegetable and animal matter coming in contact with the hot iron. The heat is not equally dif-

fused, so that one portion of a school-room is frequently overheated, while another portion, especially the floor, is too cold.

They are not furnished with seats and desks, properly made and adjusted to each other, and arranged in such a manner as to promote the comfort and convenience of the scholars, and the easy supervision on the part of the teacher. The seats are too high and too long, with no suitable support for the back, and especially for the younger children. The desks are too high for the seats, and are either attached to the wall on three sides of the room, so that the faces of the scholars are turned from the teacher, and a portion of them at least are tempted constantly to look out at the windows,—or the seats are attached to the wall on opposite sides, and the scholars sit facing each other. The aisles are not so arranged that each scholar can go to and from his seat, change his position, have access to his books, attend to his own business, be seen and approached by the teacher, without incommoding any other.

They are not provided with blackboards, maps, clock, thermometer, and other apparatus and fixtures which are indispensable to a well regulated and instructed school.

They are deficient in all of those in and out-door arrangements which help to promote habits of order, and neatness, and cultivate delicacy of manners and refinement of feeling. There are no verdure, trees, shrubbery and flowers for the eye, no scrapers and mats for the feet, no hooks and shelves for cloaks and hats, no well, no sink, basin and towels to secure cleanliness, and no places of retirement for children of either sex, when performing the most private offices of nature.

II. GENERAL PRINCIPLES OF SCHOOL ARCHITECTURE.

1. Location—Style—Construction.

The location should be dry, quiet, pleasant, and in every respect healthy. To secure these points and avoid the evils which must inevitably result from a low and damp, or a bleak and unsheltered site, noisy and dirty thoroughfares, or the vicinity of places of idle and dissipated resort, it will sometimes be necessary to select a location a little removed from the territorial center of the district. If possible, it should overlook a delightful country, present a choice of sunshine and shade, of trees and flowers, and be sheltered from the prevailing winds of winter by a hill-top, or a barrier of evergreens. As many of the pleasant influences of nature as possible should be gathered in and around that spot, where the earliest, most lasting, and most controlling associations of a child's mind are formed.

In the city or populous village, a rear lot, with access from two or more streets, should be preferred, not only on the ground of economy, but because the convenience and safety of the children in going to and from school, the quiet of the school-room, and the advantage of a more spacious and retired play-ground will be secured.

In the country, it will sometimes be desirable for two or more districts to unite and erect a school-house at some point, to which all

the older children can go from all parts of the associated districts, while the younger attend school in their several districts. In this way the school-houses can be more appropriately fitted up, and the advantage of a more perfect classification in respect both to instruction and government, as well as a wiser economy in the employment of teachers, be gained.

The style of the exterior should exhibit good, architectural proportion, and be calculated to inspire children and the community generally with respect for the object to which it is devoted. It should bear a favorable comparison, in respect to attractiveness, convenience and durability, with other public edifices, instead of standing in repulsive and disgraceful contrast with them. Every school-house should be a temple, consecrated in prayer to the physical, intellectual, and moral culture of every child in the community, and be associated in every heart with the earliest and strongest impressions of truth, justice, patriotism, and religion.

The school-house should be constructed throughout in a workmanlike manner. No public edifice more deserves, or will better repay, the skill, labor, and expense, which may be necessary to attain this object, for here the health, tastes, manners, minds, and morals of each successive generation of children will be, in a great measure, determined for time and eternity.

2. Size.

In determining the size of a school-house, due regard must be had to the following particulars.—

First.—A separate entry, or lobby, for each sex, furnished with scraper, mat, hooks or shelves, sink, basin and towels. A separate entry thus furnished, will prevent much confusion, rudeness, and impropriety, and promote the health, refinement, and orderly habits of children.

Second.—A room, or rooms, large enough to allow, 1st, each occupant a suitable quantity of pure air, i. e. at least 150 cubic feet; 2d, to go to and from his seat without disturbing any one else; 3d, to sit comfortably in his seat, and engage in his various studies with unrestricted freedom of motion; and, 4th, to enable the teacher to approach each scholar in his seat, pass conveniently to any part of the room, supervise the whole school, and conduct the readings and recitation of the several classes properly arranged.

Third.—One or more rooms for recitation, apparatus, library, and other purposes.

3. Light.

The arrangements for light should be such as to admit an abundance to every part of the room, and prevent the inconvenience and danger of any excess, glare, or reflection, or of cross-light. A dome, or sky-light, or windows set high, admit and distribute the light most steadily and equally, and with the least interruption from shadows. Light from the north is less variable, but imparts less of cheerfulness and warmth than from other directions. Windows should be insert-

ed only on two sides of the room, at least three and a half or four feet from the floor, and should be higher and larger, and fewer in number than is now common. There should be no windows directly back of the teacher, or on the side towards which the scholars face, unless the light is modified by curtains or by ground glass. Every window should be suspended with weights, and furnished with blinds and curtains; and if in a much frequented street, the lower sash should be glazed with ground glass.

4. Ventilation.

Every school-room should be provided with means of ventilation, or of renewing the vital portions of the atmosphere which are constantly absorbed, and of removing impurities which at the same time are generated, by the breathing and insensible perspiration of teacher and pupils, and by burning fires and lights.

The importance of some arrangements, to effect a constant supply of pure air, not only in school-rooms, but in any room where living beings congregate in numbers for business or pleasure, and where fires or lights are kept burning, has been strangely overlooked, to the inevitable sacrifice of health, comfort, and all cheerful and successful labor. We practically defeat the beautiful arrangements of our Creator by which the purity of the air would otherwise be preserved by its own constant renewal, and the harmonious growth and support of the animal and vegetable world maintained. We voluntarily stint ourselves in the quantity and quality of an article, which is more necessary to our growth, health and comfort, than food or drink, and which our beneficent Father has furnished pure, without money and without price, to our very lips, and so abundantly that we are, or should be if we did not prevent it, literally immersed in it all our lives long.

The atmosphere which surrounds our earth to the height of forty-five miles, and in which we live, and move, and have our being, is composed mainly of two ingredients, oxygen and nitrogen, with a slight admixture of carbonic acid. The first is called the vital principle, the breath of life, because by forming and purifying the blood it alone sustains life, and supports combustion. But to sustain these processes, there is a constant consumption of this ingredient going on, and, as will be seen by the facts in the case, the formation and accumulation of another ingredient, carbonic acid, which is deadly hostile to animal life and combustion. This gas is sometimes found in wells, and will there extinguish a lighted candle if lowered into it, (and which should always be lowered into a well before any person ventures down) and is not an uncommon cause of death in such places. It is almost always present in deep mines and at the bottom of caverns. Near Naples there is one of this description, called the Grotto del Cane, or the Grotto of the Dog, because the guides who accompany strangers to the interesting spots in the vicinity of Naples, usually take a dog along with them to show the effects of this gas upon animal life. Being heavier than common air it flows along the bottom of the cavern, and although it does not reach as high as the mouth or nostrils of a grown man, no sooner does a dog venture into it, than the animal is seized with convulsions, gasps and would die if not dragged out of it into the

pure air. When recovered, the dog shows no more disposition to return to the cavern, though called by his own name, than some children do to go to places called school-houses, where experiments almost as cruel are daily and hourly tried. But this gas, bad as it is in reference to animal life and fires, is the essential agent by which our earth is clothed with the beauty of vegetation, foliage, and flowers, and in their growth and development, helps to create or rather manufacture the oxygen, which every breathing creature and burning fire must consume. The problem to be solved is how shall we least mar the beautiful arrangement of Providence, and appropriate to our own use as little as possible of that, which though death to us, is the breath and the life blood of vegetation.

The air which we breathe, if pure, when taken into the mouth and nostrils, is composed in every one hundred parts, of 21 oxygen, 78 nitrogen, and 1 of carbonic acid. After traversing the innumerable cells into which the lungs are divided and subdivided, and there coming into close contact with the blood, these proportions are essentially changed, and when breathed out, the same quantity of air containes 8 per cent. less of oxygen, and 8 per cent. more of carbonic acid. If in this condition (without being renewed,) it is breathed again, it is deprived of another quantity of oxygen, and loaded with the same amount of carbonic acid. Each successive act of breathing reduces in this way, and in this proportion, the vital principle of the air, and increases in the same proportion that which destroys life. But in the mean time what has been going on in the lungs with regard to the blood? This fluid, after traversing the whole frame, from the heart to the extremities, parting all along with its heat, and ministering its nourishing particles to the growth and preservation of the body, returns to the heart changed in color, deprived somewhat of its vitality, and loaded with impurities. In this condition, for the purpose of renewing its color, its vitality and its purity, it makes the circuit of the lungs, where by means of innumerable little vessels, inclosing like a delicate net work each individual air cell, every one of its finest particles comes into close contact with the air which has been breathed. If this air has its due proportion of oxygen, the color of the blood changes from a dark purple to a bright scarlet; its vital warmth is restored, and its impurities, by the union of the oxygen of the air with the carbon of blood, of which these impurities are made up, are thrown off in the form of carbonic acid. Thus vitalized and purified, it enters the heart to be sent out again through the system on its errand of life and beneficence, to build up and repair the solid frame work of the body, give tone and vigor to its muscles and restring all its nerves to vibrate in unison with the glorious sights and thrilling sounds of nature, and the still sad music of humanity.

But in case the air with which the blood comes in contact, through the thin membranes that constitute the cells of the lungs, does not contain its due proportion of oxygen, viz. 20 or 21 per cent, as when it has once been breathed, then the blood returns to the heart unendued with newness of life, and loaded with carbon and other impurities which unfit it for the purposes of nourishment, the repair, and main-

tenance of the vigorous actions of all the parts, and especially of the brain, and spinal column, the great fountains of nervous power. If this process is long continued, even though the air be but slightly deteriorated, the effects will be evident in the languid and feeble action of the muscles, the sunken eye, the squalid hue of the skin, the unnatural irritability of the nervous system, a disinclination to all mental and bodily exertion, and a tendency to stupor, headache and fainting. If the air is very impure, i. e. has but little or no oxygen and much carbonic acid, then the imperfect and poisoned blood will act with a peculiar and malignant energy on the whole system, and especially on the brain, and convulsions, apoplexy, and death must ensue.

Abundant instances of the beneficent effects of pure air, and the injurious and fatal results of breathing that which is impure, might be cited from the history of hospitals and prisons, and writers generally on health and education. In the Dublin Hospital, between the years 1781 and 1785, out of 7650 children, 2944 died within a fortnight of their birth—that is, more than *one in three*. Dr. Clark, the physician, suspecting the cause to be an imperfect supply of pure air, caused it to be introduced by means of pipes into all of the apartments, and in consequence, during the three following years, only 165 out of 4242 died within the two first weeks of their birth—that is less than *one in twenty*. Dr. Buchan, at a little earlier date, by the same arrangement reduced the mortality of children in a hospital in Yorkshire, from *fifty in one hundred* to *one in fifty*. In these two cases there was an immense saving of human life. But the good done by these intelligent and observing physicians was not confined to these hospitals. For in a few years, the results of their observation and labors led to the introduction of more perfect arrangements for a supply of pure air in all structures of a similar character in England and elsewhere. And at this hour there are hospitals in this country and in England, in which there is a larger number of cubic feet of air, and that kept pure by perfect means of ventilation, allowed to *each patient*, than is contained in many school-rooms occupied by 20, 30, or 40 children, heated with a close stove, and provided with no means of ventilation except such as time and decay have made.

The diminished mortality of prisons, and the almost entire disappearance of that terible scourge, the jail fever, so frequent before the days of Howard, is to be attributed mainly to the larger allowance and regular supply of pure air secured by improved principles of prison architecture and discipline. There are instances on record, where the inmates of prisons have escaped the visitation of some prevalent sickness, solely on the ground of their cells being better provided with pure air, than the dwelling-houses all around them. The prisoners in the Tolbooth, in Edinburgh, were unaffected by the plague, which caused such dreadful mortality in that city, in 1645, and this exemption was attributed to their better supply of pure air. Humboldt in his Personal Narrative, mentions the case of a seaman who was at the point of death, and was obliged to be removed from his hammock, which brought his face to within a foot of the deck, into the open air, in order to have the sacrament administered as is the custom on board

of Spanish vessels. In this place he was expected to die, but the change from the stagnant, impure atmosphere in which his hammock was hung, to the fresh, purer atmosphere of the deck, enabled the powers of life to rally, and from that moment he began to recover. Even the miserable remnant of the party who were confined in the Black Hole of Calcutta, sick as they were of a malignant, putrid fever, recovered on being admitted to the fresh air of heaven, under proper medical treatment. But the history of this whole affair is a terrible lesson on this subject, which though often repeated, cannot be too often dwelt upon. This Black Hole is a prison in Calcutta, 18 feet square, into which the Nabob of Bengal after the capture of Fort William from the British in 1756, thrust 146 English prisoners. The only opening to the air, except the door, was by two windows on the same side, strongly barred with iron. Immediately on the closing of the door a profuse perspiration burst out on every prisoner. In less than an hour their thirst became intolerable, and their breathing difficult. The cry was universal and incessant for air and water, but the former could only come in through the grated windows, and the latter, when supplied by the guards without, only aggravated their distress. All struggled to get near the windows, and in this death-struggle as it were, many were trampled under foot. In less than three hours several had died, and nearly all the rest were delirious and prayed for death in any form. On the opening of the doors at six o'clock in the morning, less than eleven hours after it was closed, death had indeed come to the relief of 123 out of the 146, and the remainder had sunk down on their dead bodies sick with a putrid fever. Now what did all this anguish, and these murderous results spring from? From breathing over and over again air which had become vitiated and poisonous by passing repeatedly through the lungs, and by exhalations from the surface of the bodies of the persons confined there. "This terrible example," says Dr. Combe in his Principles of Physiology, "ought not to be lost upon us, and if results so appalling arise from the extreme corruption of the air, results, less obvious and sudden, but no less certain, may be expected from every lesser degree of impurity."

"In our school-rooms," says Dr. Bell, "churches, hospitals and places of public evening amusements, and even in our private dormitories, we not unfrequently make near approaches to the summary poisoning process of the Black Hole at Calcutta." We do not appreciate the magnitude of the evils produced by breathing frequently, even for a short period at any one time, a vitiated atmosphere, because the ultimate results are both remote, and the accumulation of repeated exposures. Besides, the immediate effects may be not only slight, but may apparently disappear on our breathing again a free and pure air, so that we forget to appreciate the temporary inconvenience or suffering, and to refer them to their true cause. How often do we retire at night, perfectly well, and rise up in the morning unrefreshed with sleep, with an aching head, a feverish skin, and a sick stomach, without reflecting that these symptoms of a diseased system are the necessary effects of breathing the atmosphere of a chamber, narrow

in its dimensions, closed against any fresh supply from without, and not unlikely, made still more close by a curtained bed, and exhausted of even its small quantity of oxygen, by a burning fire or lamp? These same causes, a little longer in operation, or a little more active, would produce death as surely, although not as suddenly, as a pan of ignited charcoal in the room. Who has not noticed that the fainting and sickness which so often visit persons, and especially females of delicate health in crowded churches and lecture-rooms, only occurs after the air has become overheated and vitiated, by having been a long time breathed, and that an exposure to the open air generally restores the irregular or suspended circulation of the blood? In the relief and newness of life which we experience on emerging from such places of crowded resort, we forget that the weariness and languor, both of mind and body which we suffered within, were mainly the depressing effects of the imperfectly vitalized blood, and that the relief is simply the renovated life and vigor, which the same blood, purified of its carbon by coming in contact with the oxygen of the air, imparts to the whole system, and especially to the brain. But in spite of our forgetfulness of the cause, or the apparent disappearance of the temporary inconvenience and distress, which should warn us to beware of a repetition of the same offence against the laws of comfort and health, repeated exposures are sure to induce or develope any tendency to disease, especially of a pulmonary or nervous character, in our constitutions, and to undermine slowly the firmest health. Who can look round on a workshop of fifteen or twenty females, breathing the same unrenewed atmosphere, and sitting perhaps in a position which constrains the free play of the lungs, and not feel that disease, and in all probability, disease in the form of that fell destroyer of our fair country women, consumption, will select from among those industrious girls, its ill starred victims? The languor, debility, loss of appetite, difficulty of breathing, coughs, distortion of the frame, (fallen away from the roundness natural to youth and health,) nervous irritability, and chronic affections of various kinds, so common among females in factories, even in our own healthy New England, or those who have retired from such factories to their own homes to die, or wear out a dying life all their days, are the natural fruits of an exposure, day after day, to an atmosphere constantly becoming more impure from the vitiated breath of forty or fifty persons, and rendered still more unfit for respiration by dust and minute particles floating in it, tending to irritate the already inflamed and sensitive membrane which incloses the air cells of the lungs. To this exposure in the workroom should be added the want of cheerful exercise, and innocent recreation in the open air, and the custom of herding together at night in the small, unventilated sleeping apartments of our factory boarding-houses.

In the school-room the same poisoning process goes on day after day, and if the work is less summary, it is in the end more extensively fatal, than in the Black Hole of Calcutta. Every man and woman, who received any portion of their early education in the common school, can testify to the narrow dimensions, and low ceiling of the school-

rooms, and to the discomfort arising from the close, stagnant, offensive atmosphere, which they were obliged to breathe. Who does not remember the comparative freshness and vigor of mind and body with which the morning's study and recitations were begun, and the languor and weariness of body, the confusion of mind, the dry skin, the flushed cheek, the aching head, the sickening sensations, the unnatural demand for drink, the thousand excuses to get out of doors, which came along in succession as the day advanced, and especially in a winter's afternoon, when the overheated and unrenewed atmosphere had become obvious to every sense? These were nature's signals of distress, and who can forget the delicious sensations with which her holy breath, when admitted on the occasional opening of the door, would visit the brow and face, and be felt all along the revitalized blood, or the newness of life with which nerve, muscle, and mind were endued by free exercise in the open air at the recess, and the close of the school? Let any one who is sceptical on this point visit the school of his own district, where his own children perhaps are condemned to a shorter allowance of pure air than the criminals of the State, and he cannot fail to see in the pale and wearied countenances of the pupils, the languor and uneasiness manifested, especially by the younger children, and exhaustion and irritability of the teacher, a demonstration that the atmosphere of the room is no longer such as the comfort, health and cheerful labor of both teacher and pupils require.

In this way the seeds of disease are sown broadcast among the young, and especially among teachers of delicate health. "In looking back," says the venerable Dr. Woodbridge in a communication on school-houses to the American Institute of Instruction, "upon the languor of fifty years of labor as a teacher, reiterated with many a weary day, I attribute a great proportion of it to *mephetic air;* nor can I doubt, that it has compelled many worthy and promising teachers to quit the employment. Neither can I doubt, that it has been the *great cause* of their subsequently sickly habits and untimely decease." A physician in Massachusetts, selected two schools, of nearly the same number of children, belonging to families of the same condition of life, and no causes, independent of the circumstances of their several school-houses, were known to affect their health. One house was dry and properly ventilated—the other damp, and not ventilated. In the former, during a period of forty-five days, five scholars were absent from sickness to the amount in the whole of twenty days. In the latter, during the same period of time and from the same cause, nineteen children were absent to an amount in all of one hundred and forty-five days, and the appearance of the children not thus detained by sickness indicated a marked difference in their condition as to health.

The necessity of renewing the atmosphere, does not arise solely from the consumption of the oxygen, and the constant generation of carbonic acid, but from the presence of other destructive agents, and impurities. There is carburetted hydrogen, which Dr. Dunglinson in his Physiology, characterizes, "as very depressing to the vital functions. Even when largely diluted with atmospheric air, it occa-

sions vertigo. sickness, diminution of the force and velocity of the pulse, reduction of muscular vigor and every symptom of diminished power." There is also sulphuretted hydrogen, which the same author says, in its pure state, kills instantly, and in its diluted state, produces powerful sedative effects on the pulse, muscles, and whole nervous system. There are also offensive and destructive impurities arising from the decomposition of animal and vegetable matter in contact with the stove, or dissolved in the evaporating dish.

The objects to be attained are—the removal of such impurities, as have been referred to, and which are constantly generated, wherever there is animal life and burning fires, and the due supply of that vital principle, which is constantly consumed by breathing and combustion. The first can be in no other way effectually secured, but by making provision for its escape into the open air, both at the top and the bottom of the room; and the second, but by introducing a current of pure air from the outside of the building, warmed in winter by a furnace, or in some other mode, before entering the room. The two processes should go on together—i. e. the escape of the vitiated air from within, and the introduction of the pure air from without. The common fireplace and chimney secures the first object very effectually, for there is always a strong current of air near the floor, towards the fire, to support combustion, and supply the partial vacuum in the chimney occasioned by the ascending column of smoke and rarified air, and in this current the carbonic acid and other impurities will be drawn into the fire and up the chimney. But there is such an enormous waste of heat in these fireplaces, and such a constant influx of cold air through every crevice in the imperfect fittings of the doors and windows, to supply the current always ascending the chimney, that this mode of ventilation should not be relied on. The common mode of ventilating, by opening a window or door, although better than none, is also imperfect and objectionable; as the cold air falls directly on the head, neck, and other exposed parts of the body, when every pore is open, and thus causes discomfort, catarrh, and other more serious evils, to those sitting near, besides reducing the temperature of the whole room too suddenly and too low. This mode, however, should be resorted to at recess.

There should be one or more openings, expressly for ventilation, both at the top and the bottom of the room, of not less than twelve inches square, capable of being wholly or partially closed by a slide of wood or metal, and, if possible, these openings, or the receptacle into which they discharge, should be connected with the chimney or smoke-flue, in which there is already a column of heated air. By an opening in or near the ceiling, the warmer impurities (and air when heated, and especially when over-heated, will retain noxious gases longer) will pass off. By an opening *near the floor*, into the smoke-flue, the colder impurities (and carbonic acid, and the other noxious gases, which at first rise, soon diffuse themselves through the atmosphere, cool, and subside towards the floor) will be drawn in to supply the current of heated air and smoke ascending the chimney.

These openings, however, may let cold air in, and will not always secure the proper ventilation of a school-room, unless there is a current of pure warm air flowing in at the same time. Whenever there is such a current there will be a greater economy, as well as a more rapid and uniform diffusion of the heat, by inserting the outlet for the vitiated air near the floor, and at the greatest distance from the inlet of warm air.

The ventilation of factories, mines, reading rooms, and halls intended for large assemblies of people, has received, of late, much attention from men of science and large practical views in England. In factories, the large apartments are heated by steam or hot water pipes, and the air which has become vitiated by breathing and perspiration, is drawn out by a fan-ventilator. This contrivance resembles somewhat our common fanning mill, or machine for winnowing grain. The impure air of the room is drawn into the fan to supply that which is condensed by the revolving wings, and forced out through a pipe leading into the open air.

In the House of Commons, the rapid change of air is effected by means of an artificial draft in a chimney erected on the outside of the building, and in which a large fire is kept burning, for this purpose solely. The fresh air from without is first introduced through a perforated wall into a chamber below, connected by doors with an apartment containing the hot water apparatus for warming the house. The pure air can then be warmed or not, according to the season of the year, before it passes into the apartments above. This is done, not by rising in a large volume, through one or two openings, but imperceptibly through a large number of very small holes in the floor. The air thus admitted, after becoming vitiated by respiration and combustion, escapes through apertures concealed in the ornaments of the ceiling into a common flue or receptacle above, which is connected by a descending pipe with the chimney noticed before. In warm weather, the air, before passing into the house, is cooled and freshened by jets of water playing through it, and by the melting of bags of ice suspended in the chamber below.

The rooms of the Wellington Club, Liverpool, are warmed and ventilated in nearly the same way. The air from without is first cleansed from all particles of coal dust, and other impurities, by being passed through water, and then brought to the right temperature by steam pipes in the air-chamber below. It is then forced into the room by a revolving fan through a band of minutely perforated zinc, which skirts the large apartments. Concealed in the ornamental work of the ceiling, are openings communicating with an air-chamber above, in which is a chimney shaft, and in the draft produced by a fire in this, the vitiated air is carried off so rapidly that the odor of a small quantity of rose-water poured into the air-chamber below, is, in a few seconds, perceptible in every part of the room.

The principles involved in the expensive modes of ventilation above described, can be carried out in any apartment heated by a furnace or other modes of warming pure air before it is introduced

which will be treated of in speaking of the *temperature* of school-rooms.

There is a mischievous error prevailing, that if a room is kept at a low temperature there is no need of ventilation. Dr. Alcott mentions the case of a teacher, who when asked if she did not find it difficult to keep her room ventilated, replied, "not at all, it is one of the coldest rooms in the city." The necessity of ventilation arises from the consumption of the oxygen and the generation and accumulation of carbonic acid principally in breathing, and both of these processes can go on and do go on, in a cold room, as well as in a warm one, if human beings are collected in it, and goes on rapidly and fatally according to the number of persons and the size and closeness of the apartment. Dr. Arnott, in his work on "warming and ventilating," mentions a striking instance of popular ignorance with respect to this subject, and of a mischievous practice founded upon that ignorance among some poor girls in Buckinghamshire, England, who gained their livelihood by lace-making. To save the expense of fire they were wont in winter to choose among the rooms belonging to their families, the smallest which would contain to the number of twenty or thirty of them, and then to congregate and keep themselves warm at their work by breathing. The atmosphere of the room, as might have been expected by any one acquainted with its constitution and the process going on, although unperceived by themselves, soon became exceedingly offensive to a stranger entering, as well as highly injurious to them. The pale faces, broken health and early deaths of many of these ignorant self-destroyers were the identical results, a little more remote, which are caused by the atmosphere of our school-rooms, churches, manufactories and other places where men, women or children, are crowded together. These results are quickened in an overheated atmosphere, because such air has less oxygen, and retains the impure gases longer. Still the scenes of death and misery in the Black Hole of Calcutta would have taken place, if the same prison-house had been in Greenland.

6. Temperature.

The means of producing, diffusing and duly regulating artificial heat in a school-room, is, in a climate like ours, another of the indispensable conditions of health, comfort and successful labor. To effect this, the structure must not be "a summer-house for winter residence," but be calculated to keep out the cold wind and especially to prevent its entering at cracks, and defects in the doors, windows, floors, and plastering, so as to fall suddenly and directly only on the feet, neck, or other sensitive and exposed portions of the body. Fuel of the right kind, in the right condition, in suitable quantity and in due season must be provided. The best modes of consuming it so as to extract its heat and diffuse it equally through all parts of the room and retain it as long as is safe, must be resorted to. The means of regulating it, so as to keep up a uniform temperature in different parts of the room, and to graduate it to the varying circumstances of a

school at different periods of the day, and in different states of the weather, must not be overlooked.

The open stove with large pipe, not bending till the horizontal part is carried ten or twelve feet above the heads of the children, affords as effectual, economical and unobjectionable a mode of consuming the fuel and disseminating the heat as any stove of this kind. It is far superior in point of economy to the open fireplace, as ordinarily constructed, in which near seven eights of the heat evolved ascends the chimney and only one eighth, or according to Rumford and Franklin, only one fifteenth is radiated from the front of the fire into the room. It has to some extent the cheerful light of the open fire, to which habit and association have attached us, and the advantages of the latter, in opening broadly near the floor, and thus drawing in the colder air with the carbonic acid in the current which goes to sustain the combustion and ascend the large pipe of the stove. Unless the common mode of constructing fireplaces and chimneys can be greatly improved, or the original *Franklin fireplace* or the *double fireplace* be substituted, there is no advantage in the open fireplace which cannot be secured in the large open stove. The original *Franklin stove*, or *fireplace* was constructed of cast iron, and by means of a circuitous chimney or smoke flue, which was surrounded and intersected by air passages, opening at one end out of doors, and at the other into the room, the heat of the fire was retained, and a current of fresh warm air was constantly flowing into the room. This is quite a different thing from the ordinary open fireplace. The *double fireplace* is a modification of Franklin's plan. It is made from any common fireplace by inserting within it another fireplace made of soap stone, leaving an empty space of about an inch in depth, between the two, so that when finished the back and sides may be hollow. This hollow space, communicates at one end with the open air by a pipe, and the other opens into the room, on the side of the chimney. In this fireplace the advantages of an open fire of wood or coal can be enjoyed at the same time a current of air is warmed in the rear of the fire.

Various plans have been proposed and adopted, to make the common stove, whether close or open, serviceable in warming pure air before it is thrown into the room. Mr. Woodbridge in his essay on school-houses, describes one as follows:—the stove is inclosed on three sides in a case of sheet iron, leaving a space of two or three inches beneath and around the stove, and as it rises around it becomes warmed before it enters the room at the top of the case. The case is movable so as to allow of the cleaning out of any dust which might collect between it and the stove. Mr. Palmer in his Manual for Teachers, secures the same object by conducting the air from without, into a passage which traverses the bottom of the stove five or six times before it enters the room, and thus becomes warm.

In Millar's *patent ventilating school-house stove* the air is conducted from without, into a chamber below the fire-plate, and after circulating through pipes around the fire, escapes into the room. A more minute description will be given in the second part of this essay.

The same thing can be secured by a similar arrangement connected with stoves for burning arthracite coal. In the Olmsted stove, for instance, the pure air from without can be made to pass in contact with the exterior, as well as the interior surface of the radiators and thus be warmed before entering the room. This stove has an advantage, in admiting of the slow combustion of billets of wood in connection with nut or pea coal, and thus maintaining a fire which will keep up a uniform temperature of the proper degree at the cheapest rate. The large radiating surface, which is nothing more than prolonged pipe, conveniently arranged, imbibes and diffuses all the heat evolved by the combustion of the fuel, so that at the point where it enters the chimney, the heat of the pipe is scarcely perceptible.

The best mode, however, at the same time of warming and ventilating a school-room, especially if it is large, is by pure air heated in a stove or furnace placed in the cellar or a room lower than the one to be warmed. No portion of the room, or the movements of the scholars, or the supervision of the teacher, are encumbered or interrupted by stove or pipe. The fire in such places can be maintained without noise and without throwing dust or smoke into the room. The offensive odors and impurities of burnt air, or rather of particles of vegetable or animal matter floating in the air, are not experienced. The heat can be conducted into the room at different points, and is thus diffused so as to secure a uniform summer temperature in every part of it. A room thus heated, even without any special arrangements for this object, will be tolerably well ventilated, for the constant influx of warm pure air into the room will force that which is already in it out at every crack and crevice, and thus reverse the process which is ordinarily going on in every school-room. By an opening or rather several small openings into the ceiling, or a flue, which in either case should connect with the outer air, the escape of the impure air will be more effectually secured.

But whatever may be the mode of warming adopted, whether by open fireplace, or grate, stove for wood or coal, or furnace, the temperature of the room should be uniform, and of the proper degree in every part. Not a child should be exposed to sudden and extreme changes of temperature, or compelled when overheated, or at any time, to sit against an inlet of cold air, or, with cold feet. This last is a violation of an indispensable condition of health. To secure a uniform temperature, a thermometer will not only be convenient, but necessary. It cannot be ascertained, for different parts of a room or for thirty or forty persons, differently circumstanced as to heat or cold, or differently employed, some of whom are seated, some standing or changing their position from time to time, without some less variable and uncertain standard than the teacher's feelings. However anxious he may be to make every scholar comfortable, he cannot be conscious at all times of the differing circumstances in which they are placed. He is not exposed to the rush of cold air from a broken or loose window, or from cracks in the ceiling, or the floor. He is not roasted by a seat too near the stove. He is not liable to a stagnation of the blood in the feet from want of exercise or an inconvenient bench. Even though

he were capable of thus sympathizing with them, the temperature of the room after the fire is thoroughly going, and the doors closed, may pass gradually from 65° to 90° without the change becoming perceptible. Now though we may breathe freely in such an atmosphere, gradually heated, we cannot pass into the open air 40° or 50° colder, as would be the case on most winter days, and much less receive a current of such air on a portion, and a sensitive portion of the body, without great danger. With a thermometer in the room, the beginning and progress of such a change would be indicated, and could be guarded against.

In our arrangement for artificial warmth, especially in all stoves for burning anthracite coal, where intense heat is liable to be communicated to the iron surface, if we would preserve the purity of the atmosphere at all degrees of temperature, it is necessary to secure the presence of a certain quantity of moisture. The difference between winds blowing from different quarters, as to health and comfort, is principally owing to the proportion of moisture they contain. Whenever the air has less than its due proportion, it becomes powerfully absorbent of it in every thing with which it comes in contact, whether vegetable or animal. Hence the impression of burnt air, the disagreeable sensation of dryness on the surface of the body, and the delicate membrane of the throat, the shrinking and cracking of furniture, the blight and withering of plants, which are universally experienced in a dry and overheated apartment. Most of these and other effects may be avoided by not overheating the air, but not altogether. There is a difference in the moisture of the atmosphere at different times, without reference to artificial warmth, and however careful we may be to maintain a uniform low temperature in a school-room, we are liable to experience some of the inconveniences above referred to. These can be avoided, even where the room is overheated, by an evaporating dish supplied with pure water. The water should be frequently changed. The gathering and settling of dirt and other impurities in the vessel containing the water can be guarded against by closing the top except to admit a suspended linen or cotton cloth, which will absorb the water and give it out again from its exposed surface.

7. Seats and Desks for Scholars.

In the construction and arrangement of the seats and desks of a school-room, due regard should be had to the convenience, comfort and health of those who are to occupy them. To secure these objects, they should be made for the young and not for grown persons, and of varying heights, for children of different ages, from four years and under, to sixteen and upwards. They should be adapted to each other and the purposes for which they will be used, such as writing and ciphering, so as to prevent any awkward, inconvenient or unhealthy positions of the limbs, chest or spine. They should be easy of access, so that every scholar can go to and from his seat and change his position, and the teacher can approach each scholar and give the required attention and instruction, without disturbing

any other person than the one concerned. They should be so arranged as to facilitate habits of attention, take away all temptation and encouragement to violate the rules of the school on the part of any scholar, and admit of the constant and complete supervision of the whole school by the teacher.

Each scholar should be furnished with a seat and desk, properly adapted to each other, as to height and distance, and of varying heights, (the seats from nine inches and a half, to fifteen and a half, with desks to correspond) for children of different age or size. The seat should be so made, that the feet of every child when properly seated, can *rest* on the floor, and the upper and lower part of the leg form a right-angle at the knee; and the back, whether separated from, or forming part of the adjoining desk behind, should recline to correspond with the natural curves of the spine and the shoulders. The seat should be made, as far as possible, like a convenient chair.

The desk for a single scholar should be, at least, two feet long (two and a half is better) by eighteen inches wide, with a shelf beneath for books, and an opening in the backside to receive a slate. The upper surface of the desk, except three or four inches of the most distant portion, should slope one inch in a foot. On the level portion, along the line of the slope there should be a groove to prevent pens and pencils from rolling off, and an opening to receive an inkstand. The top of the inkstand should be on a level with the desk, and be covered by a metallic lid. The end pieces or supporters of the desk should be so made as to interfere as little as possible with sweeping.

If the desk is made to accommodate two scholars on one seat, a partition, extending from the floor for four or five inches above the surface of the desk, should separate them, and if possible they should belong to different classes, so that one will be in his seat, while the other is at recitation.

The desk should not be removed from the seat either in distance or height, so far as to require the body, the neck or the chest to be bent forward in a constrained manner, or the elbow or shoulder blades to be painfully elevated whenever the scholar is writing or ciphering. These last positions, to which so many children are forced by the badly constructed seats and desks of our ordinary school-houses, have led not unfrequently to distortions of the form, and particularly to spinal affections of the most distressing character. Such marked results are principally confined to females of delicate constitutions and studious and sedentary habits. While boys and young men engage in active exercise and sport during the recess and at the close of the school, and thus give relief to the overstrained and unnaturally applied muscles, and restore the spring or elasticity to the cushion-like substance which gives flexibility to the spinal column; girls exercise less in the open air, indulge but little in those sports which give variety of motions to the joints and muscles, and are confined to duties and studies which require their being seated out of school hours too much and too long at any one time.

The effects of the posture above described, in writing or ciphering,

are increased and even induced by their being compelled to lean against the narrow edge of the writing desk, when their faces are turned towards the teacher. This edge comes against the weakest portion of the back, and the inconvenience or pain forces those exposed to it, to find relief by resting the elbows on the desk, and thus giving an unnatural elevation to the shoulder-blades—or if no support of the kind is provided, they lean against each other, support the back by closing the hands over the knee, or resort to some other awkward or unnatural position, which if long continued will cause more or less of structural deviation, amounting not unfrequently to positive disease or deformity.

Dr. Woodward in a communication appended to Mr. Mann's Report, remarks:—"High and narrow seats are not only extremely uncomfortable for the young scholar, tending constantly to make him restless and noisy, disturbing his temper and preventing his attention to his books; but they have also a direct tendency to produce deformity of his limbs. As the limbs of children are pliable or flexible, they are made to grow out of shape by such awkward and unnatural positions.

"Seats without backs have an equally unfavorable influence upon the spinal column. If no rest is afforded the backs of children while seated, they almost necessarily assume a bent and crooked position. Such a position often assumed and long continued, tends to that deformity which has become extremely common with children in modern times; and leads to diseases of the spine in innumerable instances, especially with delicate female children."

Dr. J. V. C. Smith, of Boston, in his Anatomical Class Book, says:—"There is a radical defect in the seats of our school-rooms. Malformation of the bones, narrow chests, coughs ending in consumption and death in middle life, besides a multitude of minor ills, have often had their origin in the school-room." Again, "To these wretched articles, viz. badly constructed seats and writing desks, are we to look in some measure for the cause of so many distortions of the bones, spinal diseases, chronic affections now so prevalent throughout the country."

Dr. Warren, in his admirable lecture before the American Institute of Instruction, in 1830, which should be in the hand of every teacher and parent, says:—"In the course of my observation, I have been able to satisfy myself that about one half the young females brought up as they are at present, undergo some visible and obvious change of structure; that a considerable number are the subjects of great and permanent deviations, and that not a few entirely lose their health from the manner in which they are reared." And among the causes which lead to such mournful results, he enumerates the unnatural elevation of the right shoulder, the habit of bending the neck, and the stooping posture of the body when engaged in writing, or similar exercises at school.

No child should under any circumstances be long, or frequently exposed to any one or all of these causes of discomfort, deformity or disease. Seats and desks can be as easily and cheaply made of different heights, and for convenient and healthy postures, as they are now, without reference to any such considerations. If desks must be at-

The effects of the posture above described, in writing or ciphering,

tached to sides of the room, which is objectionable in respect to ease of supervision, habits of study, as well as the morals, manners and health of children, then let the seats be provided with a movable back like those in rail-road cars and in no case be made for more than two. The kind of back referred to, is cheap and convenient for desks constructed and arranged on any other plan. It not only affords a proper support to the back, but will allow of the scholars standing up behind the seat for reading or recitation, or even for a frequent change of position which is so much overlooked in schools, and by students of every grade. No position, if long continued, is more irksome or more unhealthy, or at least operates so insidiously, and yet directly to derange the circulation and other vital functions, as sitting, especially upright, or with the neck and chest bent forward. To young children, it is cruel in the extreme, and wars directly with all healthy and symmetrical growth, besides ruining the temper, and imparting a lasting distaste to study, the school-room, and the teacher.

Little children are made to suffer, and many of them permanently, from being forced to sit long in one position, without any occupation for mind or muscles, on seats without backs and so high that their feet cannot touch, much less rest on the floor. Nothing but the fear of punishment, or its frequent application, can keep a live child still under such circumstances, and even that, cannot do it long. Who has not an aching remembrance of the torture of this unnatural confinement, and the burning sense of injustice, for punishment inflicted for some unavoidable manifestation of uneasiness and pain! Even though the seats are as comfortable as can be made, young children cannot and should not be kept still upon them long at a time, and never without something innocent or useful to do, and under no circumstances, longer than twenty-five or thirty minutes in one position, nor so long at one study, and that with frequent and free exercise in the open air. To accomplish this, great and radical changes in the views and practice of teachers, parents and the community must take place. No where, in the whole department of practical education, is a gradual change more needed, or should be sooner commenced.

If school-houses are to consist of but one room for all the children, regard must be had to the varying circumstances of the winter and summer school. In the former, the larger and older children predominate, and in the latter, the younger and smaller, and yet in both, the younger and smaller are sadly neglected, not only in matters of instruction, but in physical comfort. In summer, they, or at least, a portion of them, are seated "beyond soundings," on seats intended and occupied by the older scholars in winter; and in winter, they are packed away on smooth, high, backless slabs, and in a roasting proximity to the fire. Now there is no way of remedying this state of things, but by having a school-room large enough to accommodate all who may attend, and to have seats and appropriate desks for all the children, be they young or old, large or small. In the winter, let so many of the seats and desks for the smaller children as are not wanted be removed to the attic, or the wood-room, and their places supplied by some for the older, and in the summer let this arrangement be reversed.

without reference to any such considerations. If desks must be at-

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The most effectual way of securing appropriate accommodations for children of different age and size, is to have two or more school-rooms, one of which shall be for the younger, and be fitted up accordingly. At one end, with no windows in the wall, should be a platform of seats rising one above the other, on which the children can be arranged at suitable times, for inspection as to cleanliness, for manual exercise, and for all simultaneous exercises, such as singing, simple operations of mental arithmetic, reading of scriptural and other moral stories, and lessons on real objects, pictures and other visible illustrations. The gallery is an economical arrangement in respect to space and expense, and enables the children to fix their eye more easily on the teacher, and the teacher to observe, explain, be heard, and direct more perfectly every movement of the children, and both teacher and children, to profit by the great principle of social sympathy, and imitation. Along the sides of the room should be a passage at least two feet wide, and then a desk, so made as to hold a thin layer of sand, and receive a slate for each scholar, no matter how young. The center of the room should be unencumbered with fixtures of any kind, so as to allow of the arrangement of the school into drafts or classes, and the free movements of the children when necessary. Whatever may be the intellectual and moral exercises of schools for small children, they should be varied and in such a manner as to require frequent and varied physical movements—both change of position and place, from sitting to standing, from desk to gallery, marching, clapping of hands, and other exercises of the joints and muscles which shall bring them all into play, singing, &c. Even with this diversity of occupation in doors, young children, whose healthy and symmetrical growth is governed by the great laws of constant and cheerful motion, require gamboling, frolicsome exercises for ten or fifteen minutes, as often as every hour they are mentally occupied, in the open air, if it is pleasant, or in the woodshed or other covered building, in damp or rainy weather. A play-ground, safe from all exposure of the health and limbs of children, large enough to allow of trundling the hoop, and of free exercise of the limbs, supplied with a circular swing, &c., is an indispensable appendage to a school where children are to be reared with vigorous and symmetrical bodies.

8. Arrangements for Teacher.

The arrangements for the teacher should be such, that he can survey the whole school at a glance, address his instruction, when necessary, to the whole school, approach each scholar in his seat without incommoding any other, and conduct the recitations most conveniently to himself, and with the least interference with the study of the school.

With this view, his seat and desk should be placed in front of the school on a raised platform; the aisles should be so arranged as to separate each range of the scholars' seats; and an open space, or appropriate seats, should be provided for the reciting classes, in front or the side of his desk; or what would be better, a recitation room

opening from the platform, or else a special platform in the rear of the school.

The teacher's desk should be sufficiently large, and appropriately fitted up, to accommodate his books of reference and apparatus.

The recitation room, or place for recitation, wherever it may be, should be furnished with blackboards, stands for hanging maps and diagrams, and all appropriate apparatus.

If a platform or area for recitation is provided in the rear of the school, the attention of the scholars while reciting will be less likely to be disturbed, as the ear only will be attracted by what is going on, and the teacher can overlook the school, while conducting the recitations.

The teacher should not, however, occupy any one position permanently, or the mischievous scholars will shape their devices for concealment accordingly, and a position in the rear of the school, except for convenience in recitation, is better calculated to detect than prevent transgression. The eye of the teacher, that great instrument of moral discipline, cannot invite confidence, or meet the answering confidence of the pupil.

9. Apparatus.

No school-room can be considered complete which is not provided with such fixtures, and means of visible illustration, as will aid the teacher in cultivating in his pupils, habits of correct observation, comparison, and classification, and in making the knowledge communicated by books orally, accurate, vivid and practical.

One blackboard, at least, is indispensably necessary. This should be so placed, as to be easily accessible, and in full view of the whole school. The larger it is, the more useful it can be made. The board should be free from knots, or cracks, well seasoned, smoothly planed, and then rubbed with sand-paper, and painted black, without varnish. On the lower side should be placed a trough to receive the chalk or crayon, tin or brass holders, (called port-crayons) a rubber of cloth, wash-leather, or sponge. If the board is broad, or in two or more parts, it should be kept from warping or opening by cleates of iron or wood on the back side or ends.

If there is but one blackboard, it should be movable, so as to be used in different parts of the room. For this purpose, it must be suspended on hooks, or rings inserted in the upper edge, or what is better, on a movable frame, like the painter's easel. It is better, and will add but little to the expense, to provide, in addition to the large one, directly back of the teacher, two or three smaller and portable ones. Every recitation room should be lined with blackboards.

Each desk should be furnished with a slate, pencil holder and sponge. A slate to every scholar, young or old, is, if possible, more necessary than a blackboard. It is a miserable economy to withhold slates from children on account of their liability to be broken. The saving in the wear and tear of books, effected by the use

of slates, will more than pay for the latter, especially if they are set in a good oak frame, fastened tightly around the corners by a band of sheet iron, or even by cord or wire. The iron or wire, if used, should not project beyond the surface of the frame, or it will scratch the desk. The most appropriate place for the slate is an opening in the backside of the desk. The pencil holder can be made of brass or tin, about the size of a quill, with two slits at the end into which a short peice of pencil can be put. Without such a holder, no child should be allowed to use a short pencil. He will immediately acquire the habit of contracting his fingers around it, so as to unfit himself for holding a pen properly. If pencil holders are not provided, a long pencil should be, and the brittleness of the common slate pencil can be obviated by rolling it up in strong paper covered with paste. When dry, the paper and pencil can be shaped like an ordinary lead pencil.

With the blackboard and slate, there is no study from the simplest rudiments up to the highest department of science which cannot be illustrated and taught to better advantage, than without them, while there are some to whose attainment they are absolutely indispensable. It is painful to go into our schools, and see how many little children are trying to sit still, with no occupation for the hands, the eye, or the mind, who might be innocently and usefully employed, in a sand desk, or with a slate and pencil, in printing the alphabet, combining letters, syllables, or words, copying the outlines of angles, circles, solids, or maps, diagrams, real objects; thus acquiring knowledge as well as correctness of eye and rapidity of hand, which will be of great use afterwards in learning to write and draw with the pen on paper. It will be found invariably that children, who begin early with the use of the slate, and the blackboard, in writing, drawing, spelling, arithmetic, grammar, are more accurate, rapid and practical scholars than others much older and with better opportunities in other respects, who have not been accustomed to their use. The above articles of apparatus may be considered indispensable, and should not be left to the chance supply of parents. But there are other means in training the senses and forming correct elementary ideas which should be provided as far as practicable.

A clock, which strikes at stated intervals, is indispensable to a just distribution of the teacher's time and attention among the various classes and studies of the school, and may be made highly useful in imparting a correct elementary knowledge of the comparative lengths of different portions of time, from a second to a century, and so of the chronology of the human race.

The measure of an inch, foot, yard, and rod, marked off on the edge of the blackboard, will give a correct and visible standard of distance, to which all statements, or references in the lessons can be brought to the test.

The cardinal points accurately ascertained by the compass, painted on the ceiling, or on the teacher's platform, and associated by frequent references of the teacher, with the parts of the heavens in which the sun rises and sets, will be of incalculable service in the study of

geography. In this connection, and as introductory to drawing, plans of the school-house, playground, village-green, district, town, and county, will lead children to an accurate conception of states, continents, the earth, and the system of which it forms a part. The ideas connected with the subjects last named, cannot be properly understood without a globe, tellurium, orrery and similar apparatus.

Counters, or flat pieces of wood about an inch long and half an inch wide, a numeral frame, real measures of every kind, linear, superficial, solid and liquid, weights, models and diagrams of the geometrical forms, and solids,—articles which the pupil can touch, see, examine, experiment with, copy on the slate or blackboard, will prove invaluable helps in teaching children to form correct elementary ideas of number, size, distance, form, and measurement.

The study of geography and history can be made far more useful and interesting by *pictures* representing the great curiosities of nature and art, views of cities, and other places memorable for great events, the manners, dress, edifices, ruins &c., peculiar to each country. One set of plates, could answer very well for all the schools of a society or town, and pass in succession through the several districts.

For the study of the natural sciences, and there is no study which can be made more useful or delightful in the hands of a judicious teacher, cheap collections of minerals, and specimens or drawings of plants and animals, would not only be useful but necessary. In this department the children could collect their own cabinets, and an interchange of specimens between the different districts and towns be effected. Some of the hot days of summer had better be spent in the fields, or the woods in search of the beautiful things which God has scattered over the earth and through it, with a teacher, who has a taste for natural science, than in the hot, unshaded school-house of many districts.

The Magic Lantern in almost any of its improved forms, and especially in Carpenter's, is accompanied with diagrams to illustrate astronomy, natural history, cities, landscapes, costumes, &c., which bring the objects and truths represented so vividly before the young, that they never can forget them.

The inefficiency of school education of every name, is mainly owing to the want of such cheap and simple aids as have been briefly alluded to above, and of methods of instruction based upon, and adapted to them, begun early and continued throughout the whole course. Hence much of the knowledge of early life is forgotten, and more of it lies in dead, useless, unassimilated masses, in the memory. It does not originate, or mould, or color the meditations of the closet, and is not felt in the labor of the field, the workshop, or any of the departments of practical life. The knowledge then found available is the result of self-education, the education attained after leaving school by observation, experience and reading. Under any opportunities of school education, this self-education must be the main reliance, and the great object of all regular school arrangements should be to wake up the spirit, and begin the work of self-culture as early and widely as possible.

10. Library.

The school-house is the appropriate depository of the district library, and a library of well selected books, open to the teacher, children, and adults generally of the district, for reference and reading, gives completeness to the permanent means of school and self-education, which can be embraced in the arrangement of a school-house.

The teacher should be able to extend his own acquaintance with the studies pursued, and to illustrate and explain any name, date, event, terms of art or science, or other allusion or question which might occur in the regular lesson, or which the natural curiosity of children, if encouraged, would suggest. Above all should he be furnished with the best books which have been published on education, and especially with that class which have special reference to the duties and labors of the school-room, and have been prepared by experienced and successful teachers.

Children, even the youngest, should be provided with such books, adapted to their age and capacity, as will invest their studies with new interest, help them to observe and understand what they see and hear by the road side, in the field and in their daily conversations, and form a high standard to aim at in manners, morals and intellectual attainments. Many an idle hour would thus be redeemed, and the process of self-culture be commenced, which would go on long after their school-life was ended.

The farmer, mechanic, manufacturer, and in fine, all the inhabitants of a district, of both sexes, and in every condition and employment of life, should have books which will shed light and dignity on their several vocations, help them better to understand the history and condition of the world, and country in which they live, their own nature, and their relations and duties to society, themselves and their Creator. All that is wanted to fill the community with diligent and profitable readers among all classes, is to gratify the natural curiosity of every child "to know," to convert that curiosity into a well regulated taste, and confirm that taste into a habit, by easy access to a library of appropriate books.

Without such books the instruction of the school-room does not become practically useful, and the art of printing is not made available to the poor as well as the rich. The rich can always command more or less of the valuable works which the teeming press of the day is throwing off, but the poor must depend for their reading, on such books as public libraries, easily accessible, or the benevolence of more favored individuals, may supply.

Wherever such libraries have existed, especially in connection with the advantages of superior schools, and an educated ministry, they have called forth talent and virtue, which would otherwise have been buried in poverty and ignorance, to elevate, bless, and purify society. The establishment of a library in every school-house, will bring the mighty instrument of good books to act more directly and more broadly on the entire population of a state, than it has ever yet

done, for it will open the fountains of knowledge without money, and without price, to the humble and the elevated, the poor and the rich.

11. Yard and External Arrangements.

The external arrangement of a school-house, as connected with its attractiveness and convenience, and the health, manners, morals, love of study and proficiency of the pupils, must not be overlooked.

The building should not only be located on a dry, healthy and pleasant site, but be surrounded by a yard, of never less than half an acre, protected by a neat and substantial inclosure. This yard should be large enough in front, for all to occupy in common for recreation and sport, and planted with oaks, elms, maples, and other shady trees, tastefully arranged in groups, and around the sides. In the rear of the building, it should be divided by a high, and close fence, and one portion, appropriately fitted up, should be assigned exclusively for the use of the boys, and the other, for the girls. Over this entire arrangement, the most perfect neatness, seclusion, order and propriety should be enforced, and every thing calculated to defile the mind, or wound the delicacy or the modesty of the most sensitive, should receive attention in private, and be made a matter of parental advice and co-operation.

In cities and populous districts, particular attention should be paid to the playground, as connected with the physical education of children. In the best conducted schools, the playground is now regarded as the *uncovered* school-room, where the real dispositions, and habits of the pupils are more palpably developed, and can be more wisely trained, than under the restraint of an ordinary school-room. These grounds are provided with circular swings, and are large enough for various athletic games. To protect the children in their sports in inclement weather, in some places, the school-house is built on piers; in others, the basement story is properly fitted up, and thrown open as a playground; and in others, the wood, or coal shed is built large for that purpose. Under any circumstances the school-room should not be used for any other, than purposes of study and conversation.

An appropriate place for fuel should be provided, which, it may be well to remark, should be supplied of the right quality, in proper quantity, in due season, and in the right condition for being used.

Every school-house should have its own well, with suitable arrangements for drink, and for the cleanliness of the pupils.

A bell is always found an essential help in securing punctual attendance, and determining when the time of recess begins and ends.

III. PLANS OF SCHOOL-HOUSES.

In determining the details of construction and arrangement for a school-house, due regard must, of course, be had to the varying circumstances of country and city, of a large and a small number of scholars, of schools of different grades, and of different systems of instruction.

1. In by far the largest number of country districts as they are now situated, there will be but one school-room, with a smaller room for recitations and other purposes needed. This must be arranged and fitted up for scholars of all ages, for the varying circumstances of a summer and of a winter school, and for other purposes, religious and secular, than those of a school, and in every particular of construction and arrangement, the closest economy of material and labor must be studied. A union of two or more districts for the purpose of maintaining in each a school for the younger children, and in the center of the associated districts a school for the older children of all, or, what would be better, a consolidation of two or more districts into one, for these and all other school purposes, would do away with the almost insuperable difficulties which now exist in country districts, in the way of comfortable and attractive school-houses, as well as of thoroughly governed and instructed schools.

2. In small villages, or populous country districts, at least two school-rooms should be provided, and as there will be other places for public meetings of various kinds, each room should be appropriated and fitted up exclusively for the use of the younger or the older pupils. It is better, on many accounts, to have two schools on the same floor, than one above the other.

3. In large villages and cities, a better classification of the schools can be adopted, and, of course, more completeness can be given to the construction and arrangement of the buildings and rooms appropriated to each grade of schools. This classification should embrace at least three grades—viz. Primary, with an infant department; Secondary, or Grammar; Superior, or High Schools. In manufacturing villages, and in certain sections of large cities, regularly organized Infant Schools should be established and devoted mainly to the culture of the morals, manners, language and health of very young children.

4. The arrangement as to supervision, instruction and recitations, must have reference to the size of the school; the number of teachers and assistants; the general organization of the school, whether in one room for study, and separate class rooms for recitation, or the several classes in distinct rooms under appropriate teachers, each teacher having specified studies; and the method of instruction pursued, whether the mutual, simultaneous, or mixed.

Since the year 1830, and especially since 1838, much ingenuity has been expended by practical teachers and architects, in devising and perfecting plans of school-houses, with all the details of construction and fixtures, modified to suit the varied circumstances enumerated above, specimens of which, with explanations and descriptions, will be here given.

1. Plans of School-houses recommended by practical Teachers and Educators.

Plan, &c. recommended by Dr. Alcott, and by the American Institute of Instruction.

In 1830 the American Institute of Instruction offered a premium for the best Essay "*On the Construction of School-houses*," which was awarded in Aug. 1831, to Dr. William A. Alcott, of Hartford. The Prize Essay* was published in the proceedings of the Institute of the same year, together with a "*Plan for a Village School-house*," devised by a Committee of the Directors of the Institute.

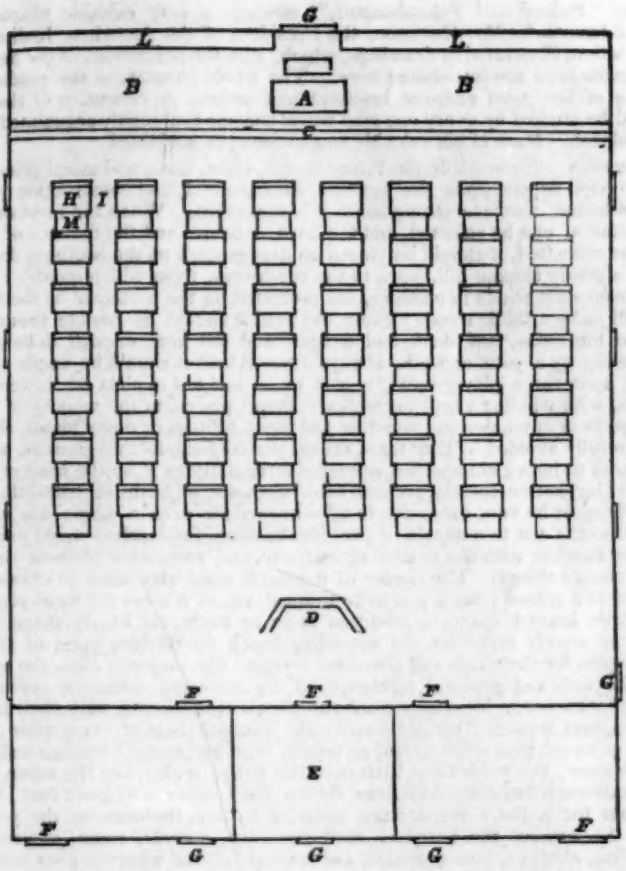
The plan of the school-room recommended by Dr. Alcott, although less complete in some of its details, is substantially the same as that recommended by Mr. Mann, and can be easily understood by reference to the cut of the latter on the opposite page. The room, to accommodate 56 pupils each, with a separate seat and desk, and from 8 to 16 small children with seats for two, should be 40 ft. long by 30 wide. The teacher's platform occupies the north end of the room, towards which all the scholars face when in their seats. Each scholar is provided with a seat and desk, (each 2 ft. by 14 inches,) the front of one desk constituting the back of the seat beyond. The top of the desk is level, with a box and lid for books, &c. The aisles on each side of the room, are 2 feet wide, and those between each range of seats and desk is 18 inches. A place for recitation 8 feet wide extends across the whole width of the room, in the rear, with movable blackboards. The room can be warmed by stove, placed as in the cut referred to, or by air heated by furnace or stove in the basement. The room is ventilated by openings in the ceiling. A thermometer, library, museum, &c., are to be furnished.

In the "*Plan for a village School-house*," the school-room is 48 ft. long by 35 wide, to accommodate eighty scholars with separate seats. The details of the arrangements are nearly the same as were at that date recommended for schools on the Lancasterian plan, and as are now recommended by the British and Foreign School Society—except that the floor of the room is level, and the seats are provided with backs. In the explanations accompanying the plan, the Directors recommend, that in villages and populous neighborhoods, the children be classified according to age and attainment into a series of schools, and that appropriate rooms for each school be provided.

Plan recommended by Horace Mann.

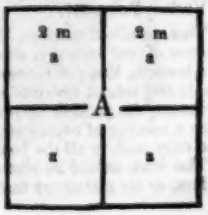
In 1838, Mr. Mann submitted a Report on School-houses, supplementary to his "First Annual Report as Secretary of the Massachusetts Board of Education," which discusses the whole subject of school architecture with great fulness and ability. This document may be found entire in the Massachusetts Common School Journal, Vol 1., and nearly so, in the Connecticut Common School Journal, Vol. 1., and the New York District School Journal, Vol. 3. It fixed public attention on the defects of these edifices, and has led to extensive improvement all over that Commonwealth. During the five years immediately following its publication, over $516,000 were expended in the construction of 405 new houses, including land, fixtures, &c., and over $118,000, in the substantial repairs of 429 more. The larger portion of the first sum has been expended in the cities and large villages in the eastern part of the state, where may now be seen specimens of the best school-houses, and the best schools, in our country. The following plan embodies substantially the views submitted by Mr. Mann, in his Report.

* This Essay of Dr. Alcott was the pioneer publication on this subject. It was followed in 1833 by a "*Report on School-houses*" prepared by the Rev. G. B. Perry, and published by the Essex County Teacher's Association. This last is a searching and vigorous exposition of the evils resulting from the defective construction, and arrangements of school-houses, as they were at that date almost universally found.



A. Represents the teacher's desk. *B B.* Teacher's platform, from 1 to 2 ft. in height. *C.* Step for ascending the platform. *L L.* Cases for books, apparatus, cabinet, &c. *H.* Pupils' single desks, 2 ft. by 18 inches. *M.* Pupils' seat, 1 ft. by 20 inches. *I.* Aisles, 1 ft. 6 inches in width. *D.* Place for stove, if one be used. *E.* Room for recitation, for retiring in case of sudden indisposition, for interview with parents, when necessary, &c. It may also be used for the library, &c. *F F F F F.* Doors into the boys' and girls' entries—from the entries into the school-room, and from the school-room into the recitation room. *G G G G.* Windows. The windows on the sides are not lettered.

For section of seat and desk constructed after Mr. Mann's plan, see p. 47. To avoid the necessity of fitting up the same school-room for old and young, and the inefficiency of such country schools as we now have, Mr. Mann proposed in this Report a union, for instance of four districts which did not cover more than four miles square, and the erection of four primary school-houses, (a a a a) for the younger children of each district, to be taught by female teachers, and one central or high school, (A) for the older children of the four districts, taught by a well qualified male teacher. This plan is recommended for its wise use of the means of the districts, and the efficiency of the instruction given.



Plans, &c., recommended by George B. Emerson.

The "School and Schoolmaster,"* contains a very valuable chapter on school-houses, by Mr. Emerson, the President of the American Institute of Instruction, illustrated by drawings, which, with the permission of the authors and publishers are introduced here. The whole chapter, as the production of one of the most eminent teachers and writers on education of the age, should be studied by every one who would become thoroughly acquainted with the subject. Most of his valuable suggestions are subjoined.

Situation.—So much do the future health, vigor, taste, and moral principles of the pupil depend upon the position, arrangement, and construction of the school-house, that everything about it is important. When the most desirable situation can be selected, and the laws of health and the dictates of taste may be consulted, it should be placed on firm ground, on the southern declivity of a gently sloping hill, open to the southwest, from which quarter comes the pleasantest winds in summer, and protected on the northeast by the top of the hill or by a thick wood. From the road it should be remote enough to escape the noise, and dust, and danger, and yet near enough to be easily accessible by a path or walk, always dry. About it should be ample space, a part open for a play-ground, a part to be laid out in plots for flowers and shrubs, with winding alleys for walks. Damp places, in the vicinity of stagnant pools or unwholesome marshes, and bleak hilltops or dusty plains, should be carefully avoided. Tall trees should partially shade the grounds, not in stiff rows or heavy clumps, but scattered irregularly as if by the hand of Nature. Our native forests present such a choice of beautiful trees, that the grounds must be very extensive to afford room for even a single fine specimen of each; yet this should, if possible, be done, for children ought early to become familiar with the names, appearance, and properties of these noblest of inanimate things. The border of a natural wood may often be chosen for the site of a school; but if it is to be thinned out, or if trees are to be planted, and, from limited space, a selection is to be made, the kingly, magnificent oaks, the stately hickories, the spreading beech for its deep mass of shade, the maples for their rich and abundant foliage, the majestic elm, the useful ash, the soft and graceful birches, and the towering, columnar sycamore, claim precedence. Next may come the picturesque locusts, with their hanging, fragrant flowers; the tulip-tree; the hemlock, best of evergreens; the celtis, or sweet gum; the nyssa, or tupelo, with horizontal branches and polished leaves; the walnut and butternut, the native poplar, and the aspen.

Of extremely beautiful American shrubs, the number is so great that I have no room for a list. What place intended to form the taste of the young, should be without the kalmias, rhododendrons, cornels, roses, viburnums, magnolias, clethras, honeysuckles, and spiræas? And whoever goes into the woods to gather these, will find a multitude of others which he will hardly consent to leave behind. The hilltop should be planted with evergreens, forming, at all seasons, a barrier against the winds from the north and east.

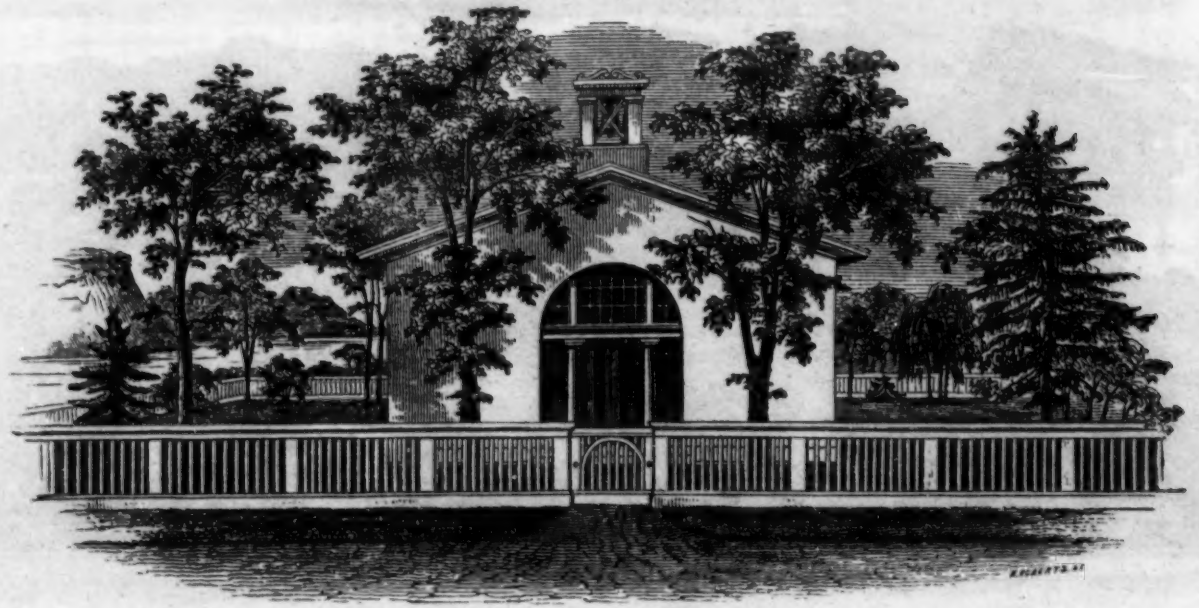
Of the flower plots, little need be said. They must be left to the taste of the teacher, and of cultivated persons in the district. I can only recommend our wild American plants, and again remind the reader, that there is hardly a

* The "*School and Schoolmaster*," a Manual for the use of Teachers, Employers, Trustees, Inspectors, &c., &c., of Common Schools. Part I. By Alonzo Potter, D. D. Part II. By George B. Emerson. pp. 552. Harper & Brothers, 82 Cliff street, New York. Price, $1.

This excellent treatise, the most valuable contribution yet made to the educational literature of our country, was prepared and published originally at the expense of James Wadsworth, Esq., of Geneseo, N. Y., in 1842. By him a copy was presented to each of the 11,000 school districts of that state. Following this noble example, the Hon. Martin Brimmer, the present mayor of the city of Boston, caused to be printed, at his expense, such a number of copies as would supply one copy each to all the school districts, and one copy each to all the boards of school committee men, in Massachusetts.

The work should be scattered broadcast through every state in the Union. In large orders, or for gratuitous distribution, it can be had of the publishers at a very low rate.

Perspective of School-house, Outbuildings, and Grounds



Front Projection of a Schoolhouse. with Trees, Shrubbery, &c.

country town in New York or New England, from whose woods and meadows a hundred kinds of flowers might not be transplanted, of beauty enough to form the chief ornament of a German or English garden, which are now neglected only because they are common and wild. Garden flowers need not be excluded; and if either these or the former are cultivated, the great object, to present something to refine and inform the taste, will be, in some degree, accomplished.

If proper inclosed play-grounds are provided, the master may often be present at the sports, and thus become acquainted with the character, of his pupils. If children are compelled to resort to the highway for their amusements, we ought not to wonder that they should be contaminated by the vices, brawlings, and profanities, which belong to frequenters of highways.

Size.—The room should be sufficiently large to allow every pupil, 1. to sit comfortably at his desk; 2. to leave it without disturbing any one else; 3. to see explanations on his lessons, and to recite without being incommoded or incommoding others; 4. to breathe a wholesome atmosphere.

If the first three objects are fully provided for, the space on the floor will be sufficient. But to secure the advantage of an adequate supply of air, the room must be not less than 10, and, if possible, 12 or 14, feet high.

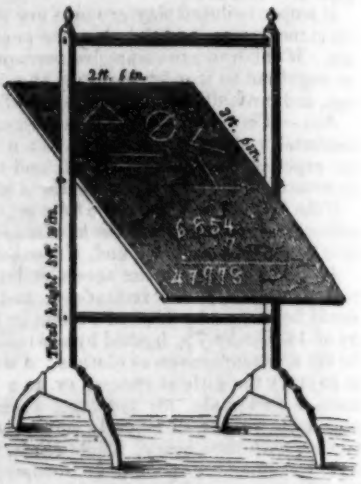
Arrangement.—For the accommodation of 56 scholars, so as to give ample room for moving, for recitations, and for air, the dimensions of the house should be 38 feet by 25, and 10 feet in height within. This will allow an entry of 14 feet by $7\frac{1}{2}$, lighted by a window, to be furnished with wooden pegs for the accommodation of clothes; a wood-room, 10 feet by $7\frac{1}{2}$, to serve also as an entry for girls at recess, or as a recitation room; a space behind the desks 8 feet wide, for fireplace, passage, and recitations, with permanent seats against the wall 10 or 11 inches wide; a platform, 7 feet wide, for the teacher, with the library, blackboards, globes, and other apparatus for teaching; the remaining space to be occupied by the desks and seats of the scholars. For every additional 8 scholars the room may be lengthened $2\frac{1}{2}$ feet. The desks and seats for scholars should be of different dimensions. A desk for two may be $3\frac{1}{2}$ or 4 feet long. If the younger children are placed nearest the master's desk, the desks in the front range may be 13 inches wide, the two next 14, the two next 15, and the two most remote 16, with the height, respectively, of 24, 25, 26, and 27 inches. The seats should vary in like manner. Those in the front range should be 10 inches wide, in the two next $10\frac{1}{2}$, in the two next 11, in the two last $11\frac{1}{2}$ or 12; and $13\frac{1}{2}$, 14, 15, and 16 inches, respectively, high. All edges and corners are to be carefully rounded.

It is very desirable that the north end of the school-house be occupied by the master's desk; that this end be a dead wall; that the front be towards the south; and that the desks be so placed that the pupils, as they sit at them, shall look towards the north. The advantages of this arrangement are, 1. that the scholars will obtain more correct ideas upon the elements of geography, as all maps suppose the reader to be looking northward; 2. the north wall, having no windows, will exclude the severest cold of winter; 3. the scholars will, in this case, look towards a dead wall, and thus avoid the great evil of facing a glare of light; or, if a window or two be allowed in the north wall, the light coming from that quarter is less vivid, and, therefore, less dangerous, than that which comes from any other; 4. the door, being on the south, will open towards the winds which prevail in summer, and *from* the cold winds of winter.

If, from necessity, the house must front northward, the master's desk should be still in the north end of the room, and the scholars, when seated, look in that direction.

The end of the room occupied by the master should be fitted with shelves for a library and for philosophical apparatus and collections of natural curiosities, such as rocks, minerals, plants, and shells, for globes and for blackboards. The books, apparatus, and collections should be concealed and protected by doors, which may be made perfectly plain and without panels, so as to be painted black and serve as blackboards. They may be conveniently divided by pilasters into three portions, the middle one for books, the others

for apparatus and collections. On one of the pilasters may be the clock; on the other a barometer and thermometer; on shelves in the corners, the globes, and over the library in the center, the study card. One of the pilasters may form part of the ventilating tube. The master's platform may be raised eight inches. For all these purposes, the space in front of the ranges of scholars' desks, should be not less than seven or eight feet wide; ten or twelve would be much better. The sides and front of this space should be furnished with seats ten or eleven inches wide, for recitation. By means of a large movable blackboard, this space may be, in case of need, converted into two, so that two classes may recite at a time. In a school intended to accommodate more than 64 pupils, there ought also to be a space for recitation in the south end of the room, separable by movable blackboards into two.

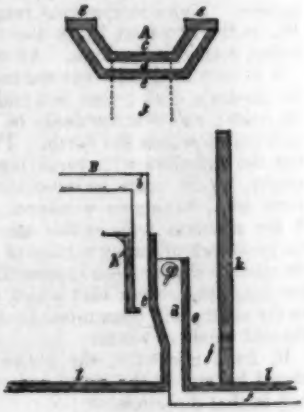


Movable Blackboard.

The entry should be lighted by a window, and be furnished with wooden or iron pins for the accommodation of hats, bonnets, and cloaks; and there should be a wood-closet large enough to contain two or three cords of wood, which may, if it is preferred, be used as a recitation room.

By making the ceiling of the entry and wood-closet only seven feet high, two commodious rooms for recitation may be formed above them, lighted from the window over the front door, and accessible by stairs from within the school-room.

Warming.—In a suitable position, pointed out in the plates, near the door, let a common brick fireplace be built. Let this be inclosed, on the back and on each side, by a casing of brick, leaving, between the fireplace and the casing, a space of four or five inches, which will be heated through the back and jambs. Into this space let the air be admitted from beneath by a box 24 inches wide and 6 or 8 deep, leading from the external atmosphere by an opening beneath the front door, or at some other convenient place. The brick casing should be continued up as high as six or eight inches above the top of the fireplace, where it may open into the room by lateral orifices, to be commanded by iron doors, through which the heated air will enter the room. If these are lower, part of the warm air will find its way into the fireplace. The brick chimney should



Fireplace.

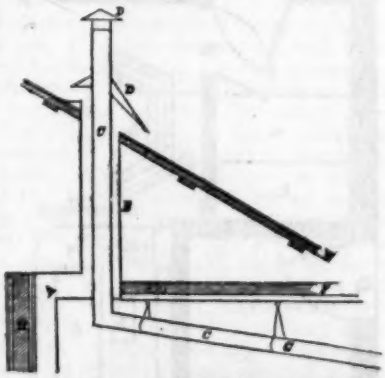
A. Horizontal section. B. Perpendicular section. *c*. Brick walls, 4 inches thick. *d*. Air space between the walls. *e*. Solid fronts of masonry. *f*. Air box for supply of fresh air, extending beneath the floor to the front door. *g*. Openings on the sides of the fireplace, for the heated air to pass into the room. *h*. Front of the fireplace and mantelpiece. *i*. Iron smoke flue, 8 inches diameter. *j*. Space between the fireplace and wall. *k*. Partition wall. *l*. Floor.

rise at least two or three feet above the hollow back, and may be surmounted by a flat iron, soap-stone, or brick top, with an opening for a smoke-pipe, which may be thence conducted to any part of the room. The smoke-pipe should rise a foot, then pass to one side, and then over a passage, to the opposite extremity of the room, where it should ascend perpendicularly, and issue above the roof. The fireplace should be provided with iron doors, by which it may be completely closed.

The advantages of this double fireplace are, 1. the fire, being made against brick, imparts to the air of the apartment none of the deleterious qualities which are produced by a common iron stove, but gives the pleasant heat of an open fireplace; 2. none of the heat of the fuel will be lost, as the smoke-pipe may be extended far enough to communicate nearly all the heat contained in the smoke; 3. the current of air heated within the hollow back, and constantly pouring into the room, will diffuse an equable heat throughout every part; 4. the pressure of the air of the room will be constantly outward, little cold will enter by cracks and windows, and the fireplace will have no tendency to smoke; 5. by means of the iron doors, the fire may be completely controlled, increased or diminished at pleasure, with the advantages of an air-tight stove. For that purpose, there must be a valve or slide near the bottom of one of the doors.

If, instead of this fireplace, a common stove be adopted, it should be placed above the air-passage, which may be commanded by a valve or register in the floor, so as to admit or exclude air.

Ventilation.—A room warmed by such a fireplace as that just described, may be easily ventilated. If a current of air is constantly pouring in, a current of the same size will rush out wherever it can find an outlet, and with it will carry the impurities wherewith the air of an occupied room is always charged. For the first part of the morning, the open fireplace may suffice. But this, though a very effectual, is not an economical ventilator; and when the issue through this is closed, some other must be provided. The most effective ventilator for throwing out foul air, is one opening into a tube which incloses the smoke-flue at the point where it passes through the roof. Warm air naturally rises. If a portion of the smoke-flue be inclosed by a tin tube, it will warm the air within this tube, and give it a tendency to rise. If, then, a wooden tube, opening near the floor, be made to communicate, by its upper extremity, with the tin tube, an upward current will take place in it, which *will always act whenever the smoke-flue is warm.*



[Scale 6 feet to an inch.]

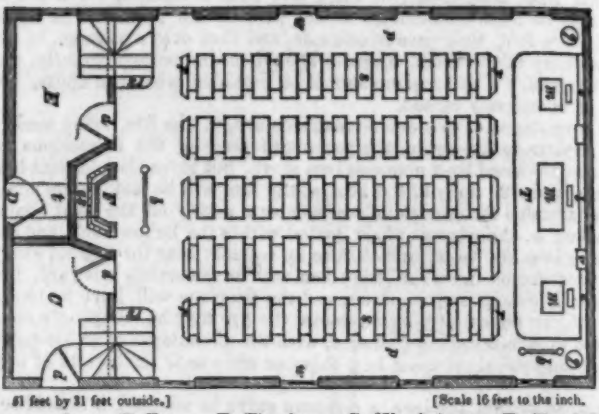
Ventilating Apparatus.

A. Air box, 1 foot square, or 24 inches by 6, covered by the pilaster, and opening at the floor, in the base of the pilaster. B. Round iron tube 15½ inches in diameter, being a continuation of the air box, through the center of which passes C. The smoke flue, 8 inches in diameter. D. Caps to keep out the rain.

It is better, but not absolutely essential, that the opening into the wooden tube be near the floor. The carbonic acid thrown out by the lungs rises, with the warm breath, and the perspirable matter from the skin, with the warm, invisible vapor, to the top of the room. There both soon cool, and sink towards the floor; and both carbonic air and the vapor bearing the perspirable matter are pretty rapidly and equally diffused through every part of the room.

Seats and Desks.—Instead of a seat and desk for each pupil, Mr. Emerson recommends that two seats should be contiguous. In his drawings, the desk is perfectly level like a table, and the back to the seat is perpendicular.

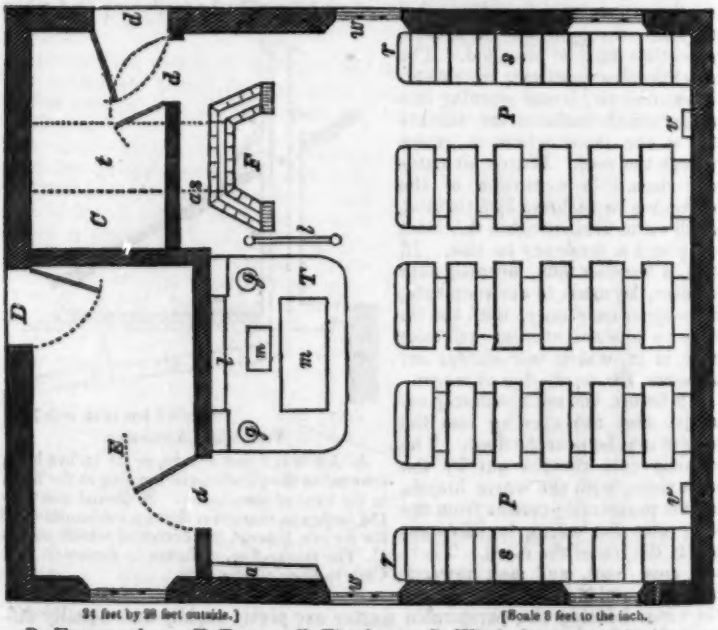
SCHOOL FOR ONE HUNDRED AND TWENTY PUPILS.



51 feet by 31 feet outside.] [Scale 16 feet to the inch.

D. Entrance door. E. Entry. F. Fireplace. C. Wood closet. T. Teacher's platform. *a*. Apparatus shelves. *t*. Air tube beneath the floor. *d*. Doors. *g*. Globes. *l*. Library shelves. *m*. Master's table and seat. *p*. Passages. *r*. Recitation seats. *s*. Scholars' desks and seats. *r s*. Stairs to recitation rooms in the attic. *v*. Ventilator. *w*. Windows. *b*. Movable blackboard. *a s*. Air space behind the fireplace.

SCHOOL FOR FORTY-EIGHT PUPILS.



34 feet by 28 feet outside.] [Scale 8 feet to the inch.

D. Entrance door. E. Entry. F. Fireplace. C. Wood closet, or recitation room T. Teacher's platform. *a*. Apparatus shelves. *t*. Air tube beneath the floor. *d*. Doors *g*. Globes. *l*. Library shelves. *m*. Master's table and seat. *p*. Passages. *r*. Recitation seats. *s*. Scholars' desks and seats. *v*. Ventilator. *w*. Windows. *b*. Movable blackboard. *a s*. Air space behind the fireplace.

Plans, &c., of an Octagonal School-house.

Furnished for the "School and School-master," by Messrs. Town and Davis.

Fig. 1.

This design for a school-house intends to exhibit a model of fitness and close economy. The principles of fitness are, 1. *Ample dimensions*, with very nearly *the least possible length of wall* for its inclosure, the roof being constructed without tie beams, the upper and lower ends of the rafters being held by the wall plates and frame at the foot of the lantern. The ceiling may show the timber-work of the roof, or it may be plastered. 2. *Light, a uniform temperature, and a free ventilation*, secured by a lantern light, thus avoiding lateral windows (except for air in summer,) and gaining wall-room for blackboards, maps, models, and illustrations. Side windows are shown in the view, and may be made an *addition* by those who doubt the efficiency of the lantern light. (The lantern is not only best for light, but it is essential for a free ventilation.) With such a light, admitted equally to all the desks, there will be no inconvenience from shadows. The attention of the scholars will not be distracted by occurrences or objects out of doors. There will be less expense for broken glass, as the sashes will be removed from ordinary accidents. The room, according to this plan, is heated by a fire in the center, either in a stove or grate, with a pipe going directly through the roof of the lantern, and finishing outside in a sheet-iron vase, or other appropriate cap. The pipe can be tastefully fashioned, with a hot-air chamber near the floor, so as to afford a large radiating surface before the heat is allowed to escape. This will secure a uniform temperature in every part of the room, at the same time that the inconvenience from a pipe passing directly over the heads of children, is avoided. The octagonal shape will admit of any number of seats and desks, (according to the size of the room,) arranged parallel with the sides, constructed as described in specification, or on such principles as may be preferred. The master's seat may be in the center of the room, and the seats be so constructed that the scholars may sit with their backs to the center, by which their attention will not be diverted by facing other scholars on the opposite side, and yet so that at times they may all face the master, and the whole school be formed into one class. The lobby next to the front door is made large, (8 by 20) so that it may serve for a recitation-room. This lobby

is to finish eight feet high, the inside wall to show like a screen, not rising to the roof, and the space above be open to the school-room, and used to put away or station school apparatus. This screen-like wall may be hung with hats and clothes, or the triangular space next the window may be inclosed for this purpose. The face of the octagon opposite to the porch, has a wood-house attached to it, serving as a sheltered way to a double privy beyond. This woodhouse is open on two sides, to admit of a cross draught of air, preventing the possibility of a nuisance. Other wing-rooms (A A) may be attached to the remaining sides of the octagon, if additional conveniences for closets, library, or recitation-rooms be desired.

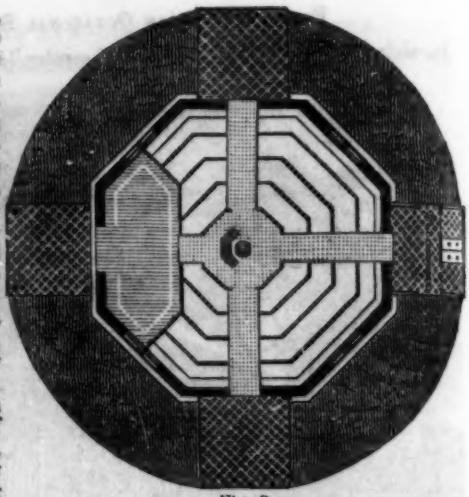


Fig. 2.

The mode here suggested, of a lantern in the center of the roof for lighting all common school-houses, is so great a change from common usage in our country, that it requires full and clear explanations for its execution, and plain and satisfactory reasons for its general adoption, and of its great excellence in preference to the common mode. They are as follows, viz.:

1. A skylight is well known to be far better and stronger than light from the sides of the building in cloudy weather, and in morning and evening. The difference is of the greatest importance. In short days (the most used for schools) it is still more so.

2. The light is far better for all kinds of study than side light, from its quiet uniformity and equal distribution.

3. For smaller houses, the lantern may be square, a simple form easily constructed. The sides, whether square or octagonal, should incline like the drawing, but not so much as to allow water condensed on its inside to drop off, but run down on the inside to the bottom, which should be so formed as to conduct it out by a small aperture at each bottom pane of glass.

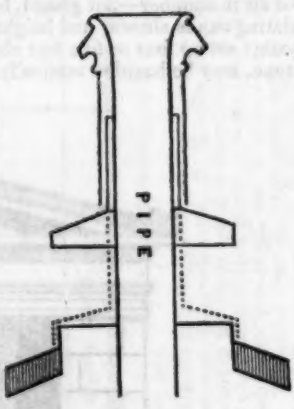
4. The glass required to light a school-room equally well with side lights would be double what would be required here, and the lantern would be secure from common accidents, by which a great part of the glass is every year broken.

5. The strong propensity which scholars have to look out by a side window would be mostly prevented, as the shutters to side apertures would only be opened when the warm weather would require it for air, but never in cool weather, and therefore no glass would be used. The shutters being made very tight, by calking, in winter, would make the school-room much warmer than has been common; and, being so well ventilated, and so high in the center, it would be more healthy.

6. The stove, furnace, or open grate, being in the center of the room, has great advantages, from diffusing the heat to all parts, and equally to all the scholars; it also admits the pipe to go perpendicularly up, without any inconvenience, and it greatly facilitates the ventilation, and the retention or escape of heat, by means of the sliding cap above.

Construction.—Foundation of hard stone, laid with mortar; the superstructure framed and covered with 1¼ plank, tongued, grooved, and put on vertically, with a fillet, chamfered

at the edges, over the joint, as here shown. In our view, a rustic character is given to the design by covering the sides with slabs; the curved side out, tongued and grooved, without a fillet over the joint; or formed of logs placed vertically, and lathed and plastered on the inside. The sides diminish slightly upward. A rustic porch is also shown, the columns of cedar boles, with vines trained upon them. The door is battened, with braces upon the outside, curved as shown, with a strip around the edge. It is four feet wide, seven high, in two folds, one half to be used in inclement weather. The cornice projects two feet six inches, better to defend the boarding; and may show the ends of the rafters. Roof covered with tin, slate or shingles. Dripping eaves are intended, without gutters. The roof of an octagonal building of ordinary dimensions may with ease and perfect safety be constructed without tie beams or a garret floor (which is, in all cases of school-houses, waste room, very much increasing the exposure to fire, as well as the expense.) The wall-plates, in this case, become ties, and must be well secured, so as to form one connected *hoop*, capable of counteracting the pressure outward of the angular rafters. The sides of the roof will abut at top against a similar timber octagonal frame, immediately at the foot of the lantern cupola. This frame must be sufficient to resist the pressure inward of the roof (which is greater or less, as the roof is more or less inclined in its pitch,) in the same manner as the tie-plates must resist the pressure outward. This security is given in an easy and cheap manner; and may be given entirely by the roof boarding, if it is properly nailed to the angular rafters, and runs horizontally round the roof. By this kind of roof, great additional height is given to the room by *camp-ceiling*; that is, by planing the rafters and roof-boards, or by lathing and plastering on a thin half-inch board ceiling, immediately on the underside of the rafters, as may be most economically performed. This extra height in the center will admit of low side-walls, from seven to ten feet in the clear, according to the size and importance of the building, and, at the same time, by the most simple principle of philosophy, conduct the heated foul air up to the central aperture, which should be left open quite round the pipe of the stove, or open grate standing in the center of the room. This aperture and cap, with the ventilator, is shown by the figure adjoining, which is to a scale of half an inch to a foot. The ventilator is drawn raised, and the dotted lines show it let down upon the roof. It may be of any required size, say two feet wide and twelve inches high, sliding up and down between the stovepipe and an outward case, forming a cap to exclude water. This cap may be pushed up or let down by a rod affixed to the under edge, and lying against the smokepipe.



In the design given, the side-walls are ten feet high, and the lantern fifteen feet above the floor; eight feet in diameter, four feet high. The sashes may open for additional ventilation, if required, by turning on lateral pivots, regulated by cords attached to the edges above. The breadth of each desk is seventeen inches, with a shelf beneath for books, and an opening in the back to receive a slate. The highest desks are twenty-seven inches, inclined to thirty, and the front forms the back of the seat before it. The seat is ten to twelve inches wide, fifteen high, and each pupil is allowed a space of two feet, side to side.

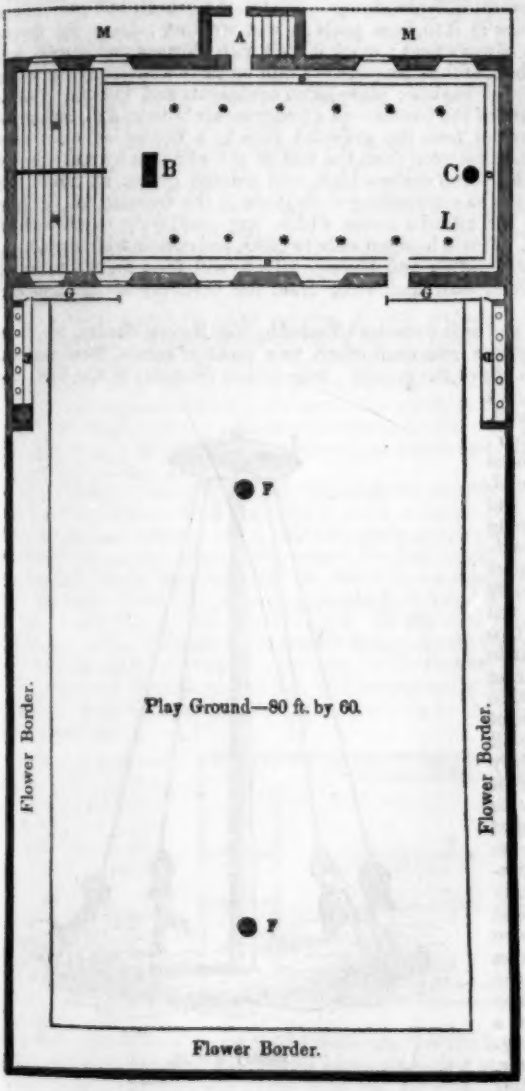
For the sake of variety, we have given a design in the pointed style, revised from a sketch by ——, an amateur in architecture. Any rectangular plan will suit it; and the principles of light and ventilation dwelt upon in the description of the octagon design, may be adapted to this. The principal light

Fig. 3.

is from one large mullioned window in the rear end. The side openings are for air in summer—not glazed, but closed with tight shutters. The same ventilating cap is shown, and height is gained in the roof by framing with collar beams set up four or five feet above the eaves. The sides, if not of brick or stone, may be boarded vertically, as before described.

Plan, &c., of School-room and Grounds for an Infant School.

The following plan and explanations are condensed from a valuable manual for teachers in infant and primary schools, entitled "Infant Education," one of Chambers' Educational Course, published at Edinburgh, in 1840. It is nearly similar to the plan recommended by Mr. Wilderspin in his "Infant School System," and his "Education for the Young," and by Mr. Stow, in the "Manual on the Training System for Infant and Juvenile Schools."

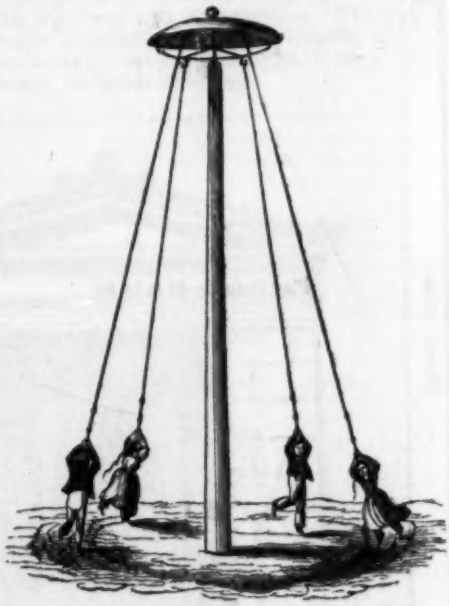


School-room, 60 feet long by 25 wide, and 18 feet high.

A. Porch and lobby, with stairs to the story above, if there should be a second story for a school for older pupils. The infant school should never be higher than the ground story. B. Movable rostrum, or small platform to hold one, two, or three children, when acting as general monitors to the whole school in the gallery. A low rail round it, will prevent them from falling from it. C. Stove, surrounded with a low rail.—(The room should be heated by a furnace.) N. Gallery, consisting of a series of steps the whole width of the room, each eight inches high, and 18 inches wide, divided in the center by a railing, one side for the boys, and the other for the girls. L. Lesson posts, to attach cards, &c. O. Seats round three sides of the room. M. Space for flowers and shrubbery protected by open fence. D. Boys', and C, Girls', water closet, on different sides of the play ground, and concealed by a screen and shrubbery, entered by covered way G. F. Gymnastic swing posts.

The house should stand in a dry and airy situation, large enough to allow a spacious play ground. No pains should be spared on this principal and paramount department of a proper infant school. The more extensive the ground may be, the better; but the smallest size for 200 children ought to be 100 feet in length, by at least 60 in breadth. It should be walled round, not so much to prevent the children from straying, as to exclude intruders upon them, while at play: for this purpose, a wall or close paling, not lower than six feet high, will be found sufficient. With the exception of a flower border, from four to six feet broad all round, lay the whole ground, after leveling and draining it thoroughly, with small *binding* gravel, which must be always kept in repair, and well swept of loose stones. Watch the gravel, and prevent the children making holes in it to form pools in wet weather; dress the flower border, and keep it always neat; stock it well with flowers and shrubs, and make it as gay and beautiful as possible. Train on the walls cherry and other fruit trees and currant bushes; place some ornaments and tasteful decorations in different parts of the border—as a honeysuckle bower, &c., and separate the dressed ground from the graveled area by a border of strawberry plants, which may be protected from the feet of the children by a skirting of wood on the outside, three inches high, and painted green, all round the ground. Something even approaching to elegance in the dressing and decking of the playground, will afford a lesson which may contribute to refinement and comfort for life. It will lead not only to clean and comfortable dwellings, but to a taste for decoration and beauty, which will tend mainly to expel coarseness, discomfort, dirt, and vice, from the economy of the humbler classes.

For the excellent and safe exercise afforded by the *Rotary Swing*, erect, at the distance of thirty feet from each other, two posts or masts, from sixteen to eighteen feet high above the ground; nine inches diameter at the foot, diminishing to seven and a half at top; of good well-seasoned, hard timber; charred with fire, about three feet under ground, fixed in sleepers, and bound at top with a strong iron hoop. In the middle of the top of the post is sunk perpendicularly a cylindrical hole, ten inches deep, and two inches in diameter, made strong by an iron ring two inches broad within the top, and by a piece of iron an inch thick to fill up the bottom, tightly fixed in. A strong pivot of iron, of diameter to turn easily in the socket described, but with as little lateral play as possible, is placed vertically in the hole, its upper end standing 4 inches above it. On this pivot, as an axle, and close to the top of the post, but so as to turn easily, is fixed a wheel of iron, twenty-four inches diameter, strengthened by four

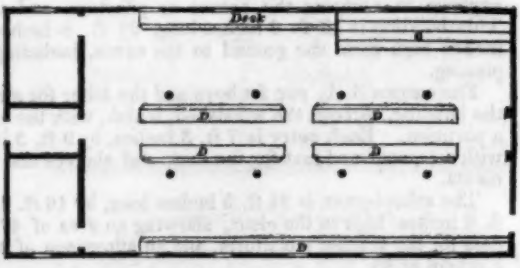


Rotary Swing.

spokes, something like a common roasting-jack wheel, but a little larger. The rim should be flat, two inches broad, and half an inch thick. In this rim are six holes or eyes, in which rivet six strong iron hooks, made *to turn in the holes*, to prevent the rope from twisting. To these hooks are fixed six well-chosen ropes, an inch diameter, and each reaching down to within two feet of the ground, having half-a-dozen knots, or small wooden balls, fixed with nails, a foot from each other, beginning at the lower extremity, and ascending to six feet from the ground. A tin cap, like a lamp cover, is placed on the top of the whole machine, fixed to the prolongation of the pivot, and a little larger than the wheel, to protect it from wet. To this, or to the wheel itself, a few waggoners' bells appended, would have a cheerful effect on the children. The operation of this swing must, from the annexed cut, be obvious. Four, or even six children, lay hold of a rope each, as high as they can reach, and, starting at the same instant, run a few steps in the circle, then suspend themselves by their hands, drop their feet and run again when fresh impulse is wanted; again swing round, and so on. A child of three or four years old, will often fly several times round the circle without touching the ground. There is not a muscle in the body which is not thus exercised; and to render the exercise equal to both halves of the body, it is important that, after several rounds in one direction, the party should stop, change the hands, and go round in the opposite direction. To prevent fatigue, and to equalize the exercise among the pupils, the rule should be, that each six pupils should have thirty or forty rounds, and resign the ropes to six more, who have counted the rotations.

Toys being discarded as of no use, or real pleasure, the only *plaything* of the playground consists of bricks for building, made of wood, four inches by two and one and a-half. Some hundreds of these, very equally made, should be kept in a large box in a corner of the ground, as the quieter children delight to build houses and castles with them; the condition, however, always to be, that they shall correctly and conscientiously replace in the box the full complement or *tale* of bricks they take out; in which rule, too, there is more than one lesson.

In a corner of the playground, concealed by shrubbery, are two water closets for the children, with six or eight seats in each; that for the boys is separate from, and entered by, a different passage from that for the girls. Supply the closets well with water, which, from a cistern at the upper end, shall run along with a slope under all the seats, into a sewer, or a pit in the ground. See that the closets are in no way misused, or abused. The eye of the teacher and mistress should often be here, for the sake both of cleanliness and delicacy. Mr. Wilderspin recommends the closets being built adjoining the small class-room, with small apertures for the teacher's eye in the class-room wall, covered with a spring lid, and commanding the range of the place. There is nothing in which children, especially in the humbler ranks, require more training.



The annexed cut represents an infant school-room, modified in a few unimportant particulars, from the ground plan recommended by Mr. Wilderspin in his "*Early Education*," published in 1840. The original plan embraces a dwelling for the teacher's family, and two school-rooms, one for the boys and the other for the girls, each school having a gallery, class-room, and playground. The school-room is about 60 feet long by 38 wide, and the class-rooms each 13 ft. by 10. D. Desks and Seats. G. Gallery, capable of accommodating 100 children.

2. Plans and descriptions of School-houses recently erected.

The following school-houses are selected for representation and description, not because they are superior to all others, or are unexceptionable in every respect, but because the plans could be conveniently obtained, and in them all, the great principles of school-architecture are observed.

Plans, &c., of School-house, District No. 6, Windsor, Ct.

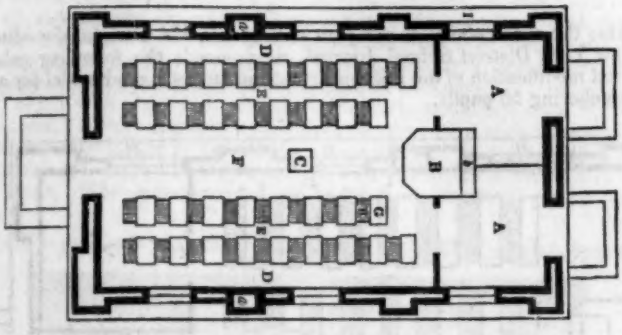
The building stands 60 ft. from the highway, near the center of an elevated lot which slopes a little to the south and east. Much the larger portion of the lot is in front, affording a pleasant play ground, while in the rear there is a woodshed, and other appropriate buildings, with a separate yard for boys and girls. The walls are of brick, and are hollow, so as to save expense in securing the antaes or pilasters, and to prevent dampness. This building is 33 ft. 6 inches long, 21 ft. 8 inches wide, and 18 ft. 9 inches high from the ground to the eaves, including 2 ft. base or underpinning.

The entries A A, one for boys and the other for girls, are in the rear of the building, through the woodshed, which, with the yard, is also divided by a partition. Each entry is 7 ft. 3 inches, by 9 ft. 3 inches, and is supplied with a scraper and mat for the feet, and shelves and hooks for outer garments.

The school-room is 24 ft. 5 inches long, by 19 ft. 4 inches wide, and 15 ft. 6 inches high in the clear, allowing an area of 472 ft. including the recess for the teacher's platform, and an allowance of 200 cubic feet of air to a school of 36.

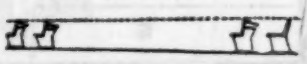
The teacher's platform B, is 5 ft. 2 inches wide, by 6 ft. deep, including 3 ft. of recess, and 9 inches high. On it stands a table, the legs of which are set into the floor, so as to be firm, and at the same time movable, in case the platform is needed for declamation, or other exercises of the

scholars. Back of the teacher is a range of shelves *b*, already supplied with a library of near 400 volumes, and a globe, outline maps, and other apparatus. On the top of the case is a clock. A blackboard 5 ft. by 4, is suspended on weights, and steadied by a groove on each end, so as to admit of being raised and lowered by the teacher, directly in front of the book case, and in full view of the whole school. At the bottom of the blackboard is a trough to receive the chalk and the sponge, or soft cloth.

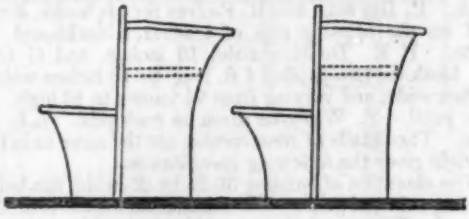


The passages D D, are 2 ft. wide, and extend round the room; E E are 15 inches, and allow of easy access to the seats and desks on either hand. F is 5 ft. 3 inches, and in the center stands an open stove C, the pipe of which goes into one of the flues, *a*. The temperature is regulated by a thermometer.

Each pupil is provided with a desk G, and seat H, the front of the former, constituting the back or support of the latter, which slopes $2\frac{1}{2}$ inches in 16. The seat also inclines a little from the edge. The seats vary in height, from $9\frac{1}{2}$ inches to 17, the youngest children occupying those nearest the platform. The desks are 2 ft. long by 18 inches wide, with a shelf beneath for books, and a groove on the back side *b*, (Fig. 4) to receive a slate, with which each desk is furnished by the district. The upper surface of the desk, except 3 inches of the most distant portion, slopes 1 inch in a foot, and the edge is in the same perpendicular line with the front of the seat. The level portion of the desk has a groove running along the line of the



Top of Desk.



Section of Seat and Desk.

slope *a*, (Fig. 4) so as to prevent pencils and pens from rolling off, and an opening *c*, (Fig. 8) to receive an inkstand, which is covered by a metallic lid.

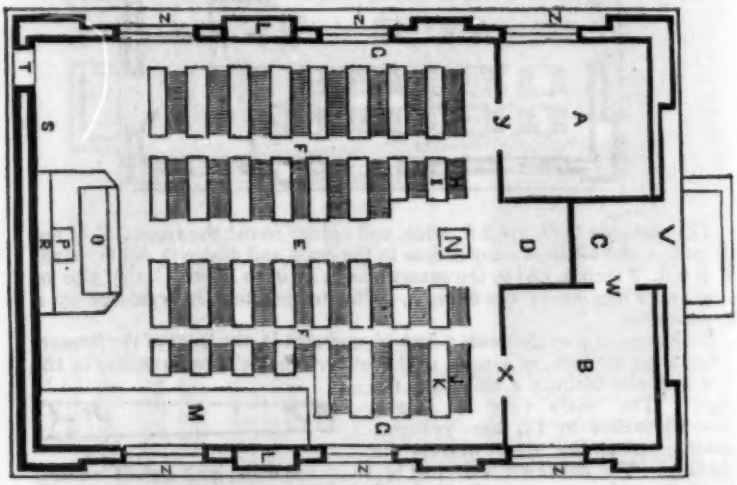
The windows, I, three on the north and three on the south side, contain each 40 panes of 8 by 10 glass, are hung (both upper and lower sash) with weights so as to admit of being raised or lowered conveniently. The sills

are three feet from the floor. Those on the south side are provided with curtains and blinds.

The proper ventilation of the room is provided for by the lowering of the upper sash, and by an opening 14 inches by 18, near the ceiling, into a flue, (Fig. 2.) *a*, which leads into the open air. This opening can be enlarged, diminished, or entirely closed by a shutter controlled by a cord.

The sides of the room are ceiled all round with wood as high as the window sill, which, as well as the rest of the wood work of the interior, is painted to resemble oak.

Taking the above elevation and plan as the basis, Mr. Dwight, the editor of the New York District School Journal, recommends the following enlargement and modification of the interior arrangements, as a good model for a district numbering 56 pupils.



The building is 36 ft. long by 26 wide, and 19 ft. high from the ground to the eaves, including 2 ft. base. V. Main entrance. C. Outer entry. W. Door leading into clothes entry B. X. Door into school-room 24 ft. by 24, and 15 ft high in the clear. N. Stove D. Recess for wood. Y. Door to recitation and library room A. M. Platform for recitation. O. Teacher's desk. P. His seat, and R. shelves for his books, &c. S. Map of the World, and on the opposite side of teacher, a blackboard. E. Center aisle 2 ft. wide. F F. Division aisle, 18 inches, and G G side aisles, 20 inches. K. Desk for two pupils, 4 ft. long by 18 inches wide. J. Seat for two, 12 inches wide, and varying from 9½ inches to 16 high. H I. Seat and desk for one pupil. Z. Windows three on each side. L L. Ventilation and smoke flue. The details of construction are the same as in the preceding plan. Mr. Dwight gives the following *specification*.

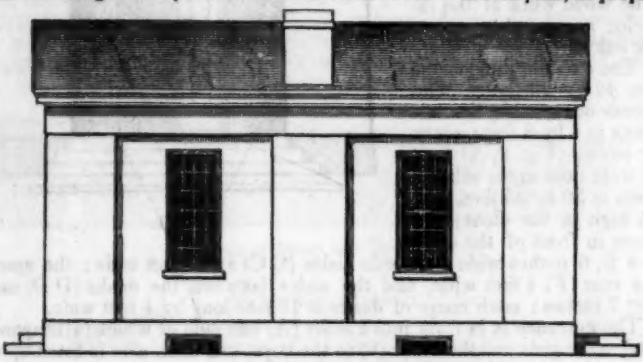
The elevation of building 36 ft. by 26 wide, the height of posts 17 feet, including sills and plates. The foundation course to be 2 feet out of, and 2 under ground. The foundation should be drained by a blind drain running around on the outside of foundation wall at bottom, 6 in. by 6 in., filled with pounded stone. Size of sills, 8 by 8 in.; posts, 8 by 8 in.; plates, 8 by 8 in.; studding, 3 by 8 in, 16 inches from center, with the exception of partitions in the interior, which should be 3 by 4 in.; there should be 2 pair of trussel or principal rafters for support of roof, size of timber as follows: Tie beams 8 by 8 in.; principal rafters, 8 by 8 in.; king posts, 7 by 8 in.; jack braces, 6 by 7 in.; small rafters, 3 by 4 in., two feet apart. Floor timbers, 3 by 10 in., two

feet from centers; ceiling timbers, 3 by 6 inches, 16 inches from centers; purlin beams 5 by 8 inches. The roof to be framed and secured with bolts.

The outside of main building and roof to be close boarded with hemlock or pine boards, the sides covered with half inch siding or clapboards, with a lap of 1½ in. The cornice and entablature to be the same as represented in the front elevation, with raking cornice at each end of the building, the roof to be covered with white pine shingles 5½ inches to the weather, or less than one third of their length.

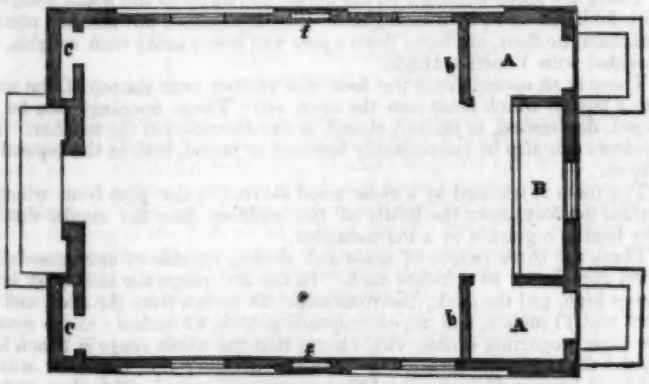
The floor should be of 1½ inch plank, tongued and grooved. The sides of the room should be ceiled up as high as 3 ft. from the floor, or under side of window sill, tongued and grooved. There will be 6 windows, 3 on north side, and 3 on south side, the upper and lower sash to be hung with weights and cords, and to be fastened with sash locks, to prevent them from being hoisted from the outside. There will be 4 doors, 1¾ inch in thickness. The windows and doors cased with plain face castings, with back moulding; base to be put down about 7 inches in width, with a bead on upper edge, well secured to floor in rooms A and B, and in hall C, the remaining part of sides, walls, ceiling and partitions to be lathed and plastered, with two coats of brown and one of hard finish. The school-room is 24 by 24 feet; height of ceiling in clear 15 feet.

The following cuts represent a modification of the Windsor plan, as prepared



Side Elevation.

for a Primary School in Hartford. The entries (A A) are smaller. The teacher's platform is at the end, so as to overlook both yards in the rear.



Ground Plan.

Plans, &c., of a School-house in Washington District, Hartford, Ct.

This house is calculated to accommodate at least one hundred children, divided into a lower and upper department. For the present, the basement is not fitted up, and the upper room is arranged for a school of at least sixty pupils, of the ordinary school age, and is recommended for country districts of that number of children.

The building stands back 24 feet from the highway, on a dry, pleasant site, and at a distance from any other building. The lot includes a quarter of an acre, and is divided in the rear into two yards, one for the boys, and the other for the girls.

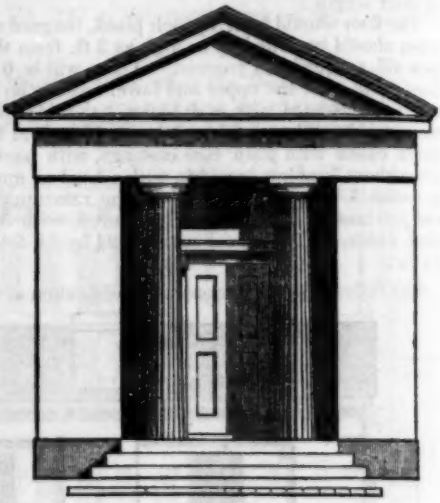


Fig. 1.

It is built of brick, with some reference to the laws of good taste, as well as comfort and convenience. The wood work of the interior is painted to resemble oak.

The exterior dimensions are 40 by 26 feet. The recess occupied by the columns is 4 by 8 feet; entry or lobby, (Fig. 2, A) is 8 ft. wide; the upper schoolroom is 30 by 25 feet, and 14 high in the clear; the space in front of the desk is 8 ft. 6 inches wide; the side aisles (C C) are 3 feet wide; the space in the rear (F) 4 feet wide, and the aisles between the desks (D D) each 2 feet 7 inches; each range of desks is 18 feet long by 4 feet wide.

The entrance is in front into a lobby (A) one side of which (a) is appropriated to the girls and the other (b) to the boys, and each side is fitted up with shelves, (a a) and hooks for hats, and outer garments. Scrapers, (r r) mats, (t t) and a shelf (c) for pail, wash basin, towel, drinking cup, &c., are provided for the comfort and convenience of the children, and to enable the teacher to enforce habits of neatness, order and propriety.

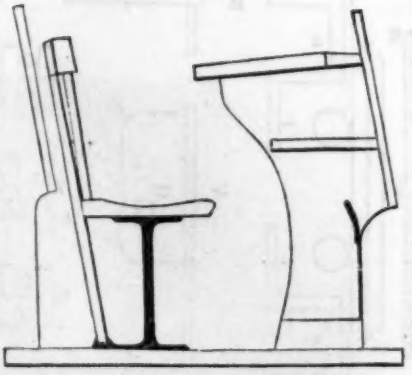
There are three windows on the north, and three on the south side, each with 32 lights of 12 by 8 inch glass. These windows are inserted nearly 4 feet from the floor, are hung (both upper and lower sash) with weights, and provided with Venetian blinds.

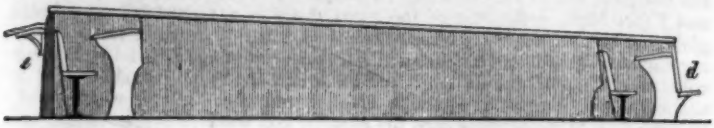
There is an opening near the floor, and another near the top of the room, into a flue (*i*) which leads into the open air. These openings can be enlarged, diminished, or entirely closed, at the discretion of the teacher. The windows can also be conveniently lowered or raised, both at the top and the bottom.

The room is warmed by a close wood stove, (S) the pipe from which is carried ten feet above the heads of the children into the smoke flue (*h*). The heat is regulated by a thermometer.

There are three ranges of seats and desks, capable of accommodating, when completed, 18 scholars each. In the first range the back seat is 18 inches high, and the desk, (the front edge) 29 inches from the floor, and the front seat 11 inches, and the corresponding desk, 23 inches; in the second, the same proportion is observed, except that the whole range is 1 inch lower, and the third, one inch lower than the second; i. e. the back seat of the third range is 16 inches, and the corresponding desk, 27 inches, and the

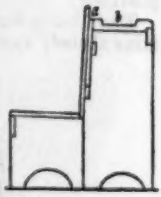
front seat 9 inches, and the desk 21 inches from the floor. Each scholar is provided with a chair, (Fig. 3) detached from the desk behind, and fastened to the floor by an iron pedestal. Each range of desks is divided by a partition extending from the floor to four inches above the surface of the desk. This partition, to which the desks are attached, gives great firmness to each, and at the same time separates the scholars from each other, and economizes room. Each desk is two feet long, (it should be 2 ft. 6 inches) and from 13 to 18 inches wide, with a shelf beneath for books. The upper surface of the desk, except 3 inches of the most distant portion, slopes 1 inch in a foot. Along the edge of the slope and the level portion, is a groove, to prevent pens and pencils from rolling off, and in the level part an opening (b) to receive a slate, (and there should have been another (c) for the inkstand, with a butt or metallic lid to close over it. Each desk should also have a sponge, pen wiper, and pencil holder, (a tin tube,) attached to it.)





Range of Seats and Desks.

To accommodate six of the oldest and largest scholars in winter, a desk like a table leaf, will be attached to the highest end of each range (Fig. 2, 4, e e e) and to accommodate the same number of the smallest in summer, sand desks, (Fig. 5) can be placed at the lowest end (d d). The smaller children will ultimately be accommodated in the lower room.



The platform (B) for the teacher, occupies the space between the doors which open into the school-room, and is 9 feet long, 4 feet 6 inches wide, and 9 inches high. On it is a desk, (Fig. 2) 4 feet long by 2 feet wide, supported by two (v v) hollow pedestals, which will accommodate the books, &c., of the teacher. The lid of the desk is a slope, but can be supported by slides in the box of the desk so as to be a level. From the platform the teacher can conduct the instruction of his classes, arranged around it, or on either side, or in the area, (L) in the rear of the school, and at the same time have the rest of the school under his supervision.

Each desk is furnished with a slate of the best quality, and made strong by a band of iron over the corners fastened with screws. Behind the teacher, and in full view of the whole school, and accessible to the reciting classes, is a blackboard 9 feet long by 4 feet 6 inches wide, with a trough at

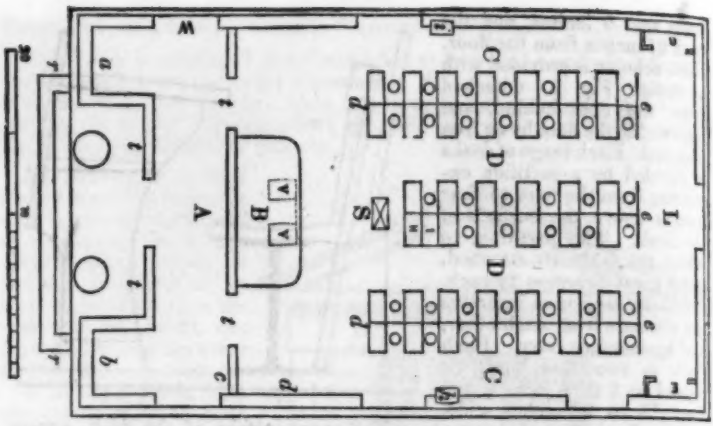


Fig. 2.

the bottom to receive the chalk or crayon, a sponge or soft leather. Over the black-board, are the printed and written alphabet, arithmetical and geometrical figures, the pauses, &c., for copying or general exercise. Along the edge of the blackboard, the length of an inch, foot, yard, &c., are designated. Over the teacher's platform, on the ceiling, the cardinal points of the compass are to be painted. In a case (G) 4 feet wide, 15 inches deep, and 7 feet high, in the rear of the room, there is a terrestrial and celestial globe, an orrery, a set of geometrical solids, a set of alphabetical and drawing cards, arithmetical blocks, and a numerical frame, a model to illustrate cube root, a set of outline maps and historical charts, a movable stand to support maps, diagrams, movable blackboards, &c. On the western wall, on each side of the window, are the eastern and western hemispheres, each six feet in diameter. There are also maps of Connecticut, Massachusetts, and the United States, and Catherwood's plan of Jerusalem, together with maps illustrative of the history of the bible. An eight-day clock is also provided.

The library case (E) is of the same size as the apparatus closet, and contains already nearly 400 volumes.

Fig. 6.

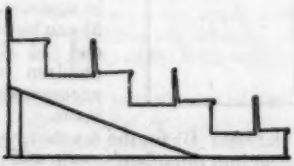
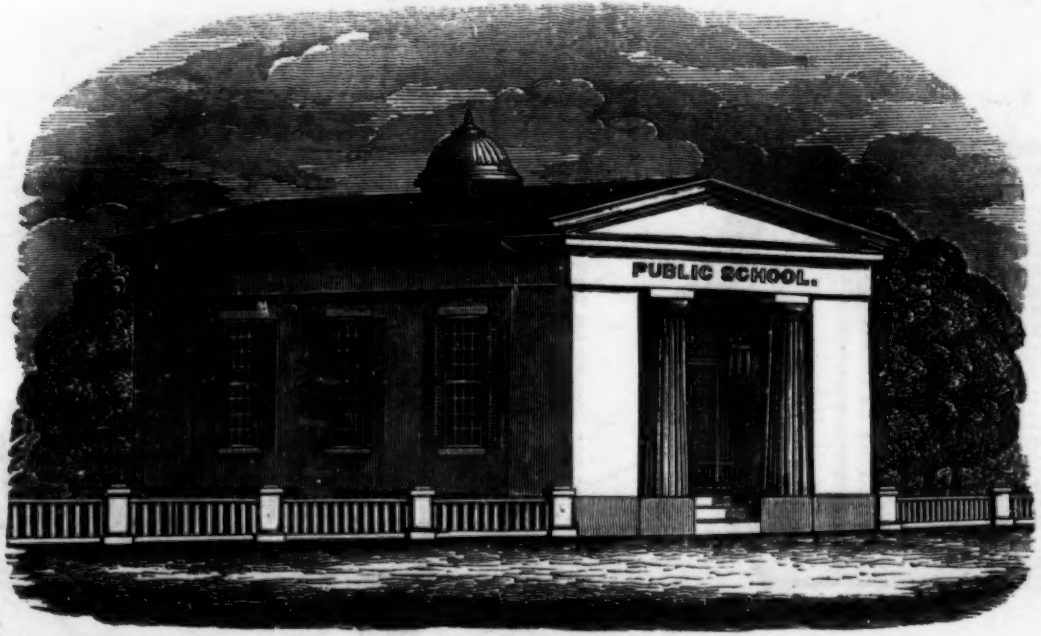


Fig. 7.

The movable stand for blackboard (Fig 6) is like a painter's easel. *a*. Pins on which the board rests. *c*. Hinge or joint to the supporting legs which are braced by hook *b*.

The primary department may be fitted up with a gallery, (Fig. 7) as is recommended by Mr. Wilderspin for infant schools, consisting of a series of seats, ascending from the floor. The first or lowest is 8 inches; each ascending, one being one inch higher than the next before it.



View of Whiting Street Primary School. New Haven.

Plan, &c., of High School, Middletown, Ct.

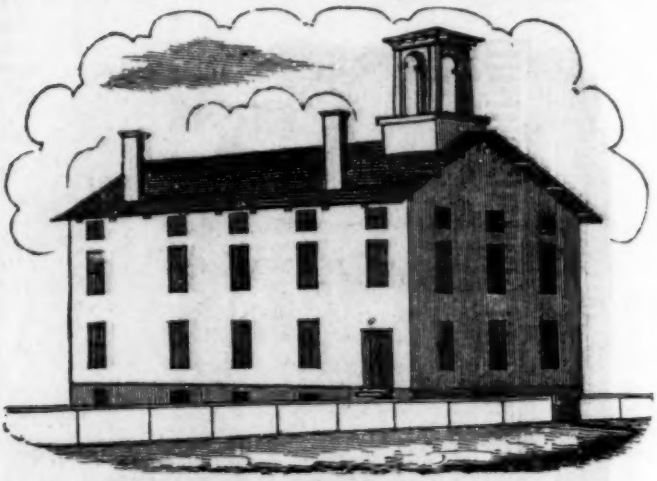


Fig. 1.

The High School building is located on Parsonage street, away from the business part of the city. The lot is 227 ft. on the street, by 200 ft. deep, and is divided into two equal parts, one of which is appropriated to the boys, and the other to the girls. The building stands near the center of the lot, east and west, and 12 feet from the street. The entrances are on the side next to the street.

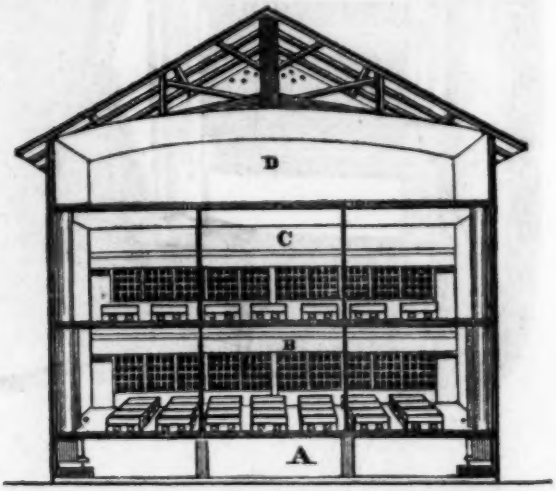


Fig. 2. Transverse Section.

A. Basement, 90 ft. by 50, and 9 ft. in the clear. B. Male Department, 50 ft. by 47, and 12 ft. high in the clear, with two recitation rooms 25 ft. by 12. C. Female Department, same dimensions as Male Department. D. Attic arched, appropriated for calisthenic exercises.

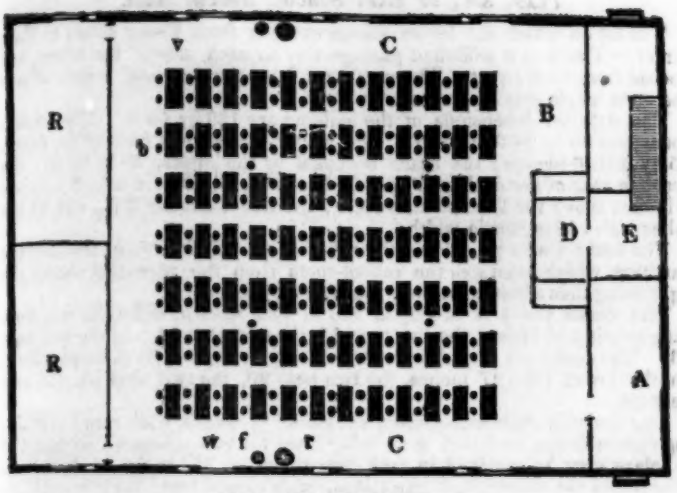


Fig. 3. Male Department.

The exterior dimensions of the building are 72 ft. by 54. It is two stories high, with a basement 9 ft. in the clear, and an arched attic, 6 ft. to the spring of the arch. The first story is occupied by the male department, and the second by the girls' department. The basement will be used as a play ground for the boys in wet weather, and the attic is appropriated for calisthenic exercises for the girls, and meetings of the whole school.

The lower school-room is 50 ft. by 47, and 12 ft. high in the clear, with two recitation rooms, each 25 ft. by 12. The entrance is from the East, near the end, into a lobby (A) 8 ft. wide, and fitted up with scraper, mats, hooks, &c. &c.

The desks are so placed, that the scholars face towards the teacher's platform, (D) which is against the northern partition, separating the school-room from the entry. The desks are placed in seven ranges, containing each 12 desks, each desk accommodating two scholars, and the front of one desk constituting the back of the preceding one. The seats and desks are painted green. Each range is separated from the other by an aisle 18 inches wide, and the whole body of desks is surrounded on three sides by an open space (C C) 6 feet wide.

On each side of the teacher's platform (D) there is a platform with an open space (B) in front, of 10 ft., of half the elevation, for two assistants. In the rear of the platform is a room (E) appropriated to the teacher.

The recitation rooms are separated from the school-room by a glass partition. Two sides of each is occupied by blackboards.

The school-rooms and recitation rooms are ventilated by openings at the top and bottom, into eight flues carried up in the wall into the space between the arch of the attic and the roof. This space communicates at all times with the open air by a grating at either end, (as indicated in Fig. 1 and 2.)

The school-room is heated by two furnaces in the basement, the hot air ascending through the openings (r r) into the lower room, and carried into the second story and attic, by conductors (f f.)

There are six large windows to the school-room, and one to each recitation room. The windows are protected by venetian blinds, which are never opened. The amount of light is graduated by opening or closing the slats.

The girls' school-room is on the second floor, and is, in every respect like the one below. Both rooms are well supplied with blackboards, an with a set of Mitchell's series of Outline Maps, and globes.

Plan, &c., of East School, Salem, Mass.

The lot on which the house stands extends from Essex street to Bath street.—There is a sufficient passage-way on each side of the house, and access from each street. The north end faces the common, which affords the most ample play-ground, always open.

The exterior dimensions of the building are 136 by 50 ft. The school-rooms are 65 by 36 ft. and 15 ft. high, each: the space in front of the desks, 65 by 4 ft. 6 inches; the space occupied by the desks, 59 by 25 ft.; the space in rear of the desks, 65 by 6 ft. 6 inches; the floor of which is raised 8 inches above the floor of the rooms; the side aisles are 3 ft., and all the other aisles 18 inches in width.

The desks are so placed that the scholars sit with their faces towards the partition which separates the school-room from the recitation rooms, the light being thus admitted in their rear and on one side.

The desks are 4 ft. in length, and of four sizes in width, the two front ranges being 16 inches, the two next 15, the two next 14, and the two next 13. The desks are also of four sizes in height; the two front ranges being, on the lower side, 27 inches, the two next 26, the two next 25, the two next 24.

The desks in each school-room are placed in ranges, each range containing eleven desks, and each desk being fitted for two scholars; so that 176 scholars may be received in each department, or 352 in the whole school. The desks are constructed like tables, with turned legs, narrow rails, inclined top and a shelf beneath. The legs and rails are of birch, stained and varnished, and the tops of cherry, oiled and varnished. The legs are secured in the floor by tenons. The tables of the teachers are constructed and finished like the desks of the scholars.

The chairs are also of four sizes; those in the two front ranges being 12 by 12½ inches in the seat, (i. e. extreme width, the sides being of the usual shape of chairs,) and 16 inches in height, and those in the succeeding ranges being reduced in height in proportion to the desks, and also varying proportionally in the dimensions of the seats.

The chairs are constructed with seats of bass wood, and cherry backs; the seats and backs hollowed, and the seats resting on wooden pedestals, secured to the floor by tenons and screws.

Upon the front edge of the raised platform, in the rear of the desks, settees are placed, which are of the same length as the desks, and are placed in corresponding positions, with intervening spaces in continuation of the aisles. The settees are placed with the back towards the desks, and are designed exclusively for the use of classes attending reviews before the principals. The settees in width and height correspond to the largest size of chairs, and are constructed of the same materials, and finished in the same style.

In the center and at the extremities of the range of settees, are placed tables, (of 4 by 2 ft. 6 inches, oval shape,) which are occupied by the assistants, during general exercises, when the station of the principal is in front of the desks, the middle one being used by the principal when attending reviews.

Each recitation room (18 by 10 ft.) is appropriated to a single course of study, as marked upon the plan, and is therefore used exclusively by one assistant. Three sides of the room are appropriated to seats, being lined with cherry wood, (oiled and varnished) to a height reaching above the heads of the scholars. The lining is projected at the bottom, so as to furnish inclined backs to the seats, which are constructed of cherry wood, 13 inches in width, 2 inches thick, with hollowed top and rounded edge, supported on turned legs, the height being 15¼ inches from the top of the seat to the floor. The fourth side of the room, opposite the window, is occupied by a blackboard of 3 ft. in width, which extends across the space upon each side of the door.

All the spaces between the doors and windows upon the four sides of the

school-rooms are occupied by blackboards. In the spaces between the windows upon the rear, recesses have been constructed, which are fitted with book-shelves, and are closed by means of covers in front, which are raised and lowered by weights and pulleys. These covers are blackboards, and are so finished as to represent sunken panels. Drawers are constructed beneath the blackboards to receive the sponges, chalk, &c.

Circular ventilators are placed in the ceiling of each school-room and recitation room; three in each school-room of 3 ft. in diameter, and one in each recitation room of 2 ft. in diameter. These ventilators are solid covers of wood, hung with hinges, over apertures of corresponding size, and raised or lowered by means of cords passing over pulleys, through the ceiling into the room below, the cords terminating in loops, which are fastened to hooks in the side of the room. When the ventilators are raised, the impure air escapes into the garret, the ventilation of which is also provided for by means of the circular windows in the gable ends, which turn on pivots in the center, and are opened or shut by cords passing over pulleys in the same manner as the ventilators.

Each school-room is warmed by a furnace, placed directly under the center of the space in front of the desks, the hot air ascending through a circular aperture of 2 ft. in diameter, which is represented upon the plan. The smoke-pipe, (of galvanized iron) is conducted upward through the center of this aperture, and thence, after passing a considerable distance into the school-room, through one of the recitation rooms into the chimney, which is built in the center of the front wall. The recitation rooms are warmed by means of apertures at the top and bottom respectively of the partitions which separate them from the school-rooms, which being open together, secure a rapid equalization of temperature in all the rooms. These apertures are fitted to be closed, with revolving shutters above, and shutters hung on hinges below.

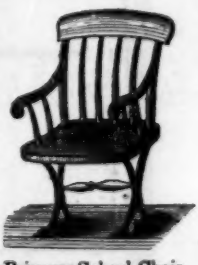
In the partition wall between the school-rooms, is a clock having two faces, and thus indicating the hour to the occupants in each room. The clock strikes at the end of each half hour. In the ante-rooms, (marked F, F, on the plan Fig. 1) are hooks for caps, overcoats, &c. In each of these rooms, also, there is a pump and sink.

In the *lower story*, there are two primary school-rooms 36½ ft. by 24½ ft., each seating 60 children. Each child has a chair firmly fixed to the floor, but no desk. In the rear there is an appropriate shelf for books, for each pupil, numbered to correspond with the number on the chair. In front of the school, there is a blackboard occupying the distance between the doors, and a desk, at which the several classes stand in succession, and copy appropriate exercises on the slate from the blackboard.

For this school-house, with all its completeness of arrangements and regulations, the city of Salem is indebted mainly to the indefatigable exertions of the late Mayor, the Hon. Stephen C. Phillips. During the three years of his administration, every school-house was repaired or rebuilt, and all the schools brought under an admirable system. On leaving his office, in 1842, he gave to the city for school purposes, his salary for three years, amounting to $2,400, which has been applied to repairing and refurnishing the High School building, which is now a monument of his taste and munificence.

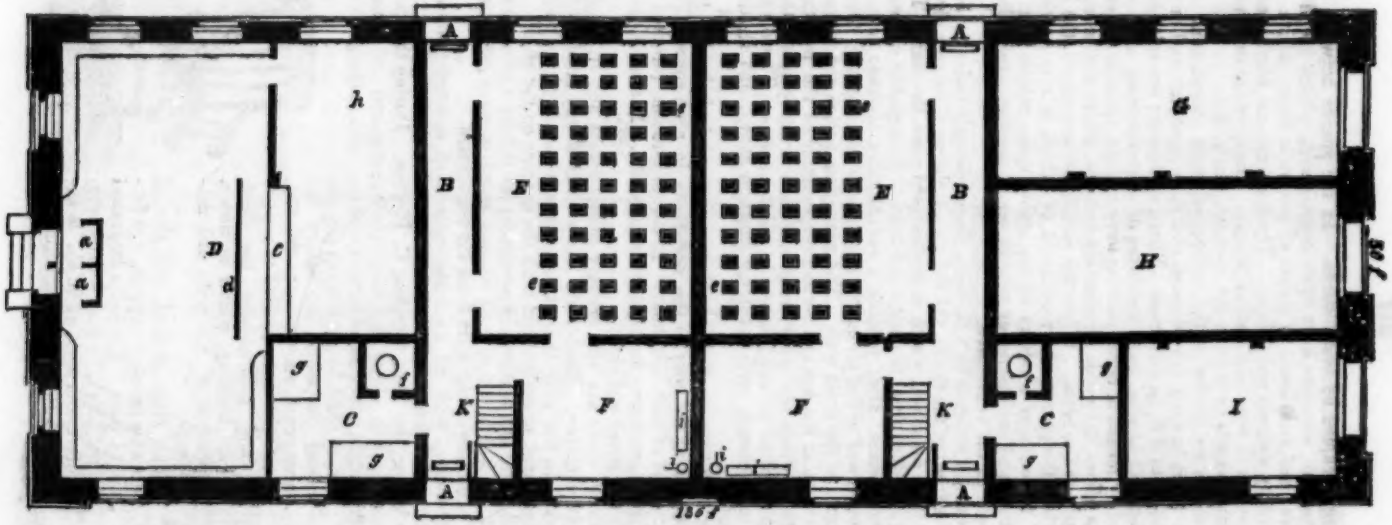
High School Chair.

The High School, and one of the new primary schools, are furnished with "Kimball's Improved School Chair," which for strength, comfort, and style of finish, is superior to any other now before the public.



Primary School Chair.

FIGURE 1 EAST SCHOOLHOUSE, SALEM. *First Story.* [Scale 1-20 inch to a foot.]



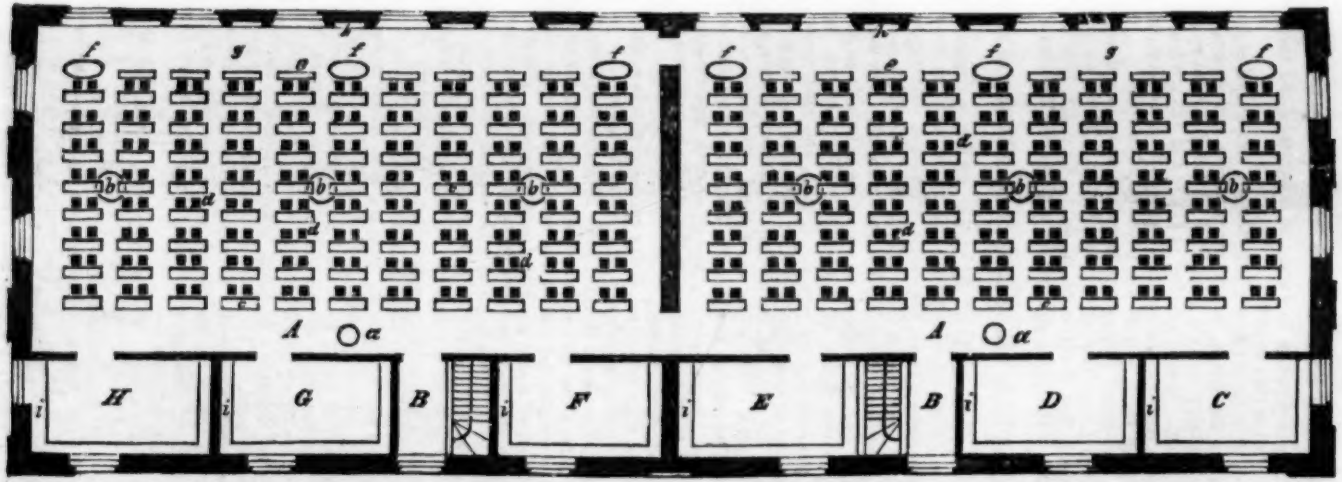
A, A, A, A—School entrances.
B, B—Passages, 5 feet wide.
C, C—Furnace and fuel rooms, 15 by 13 feet.
E, E—Primary schools, 36.6 by 24.3 feet.
e, e—Seats in primary schoolrooms.

F, F—Ante-rooms, 15 by 19 feet.
K, K—Stairs to second story.
f, f—Furnaces.
g, g—Fuel and ash bins.
i, i, i, i—Pumps and sinks.

The other apartments in the lower story are occupied for various city purposes, which it is unnecessary here to specify.

FIGURE 2. EAST SCHOOLHOUSE, SALEM. *Second Story.* [Scale, 1-20 inch to a foot.]

FIGURE 2. EAST SCHOOLHOUSE, SALEM. *Second Story.* [Scale, 1 20 inch to a foot.]



A, A—Schoolrooms, 65 by 36 feet each.
B, B—Entries and stairs from the first story.
C—Recitation room for reading, first course, 17 by 10 feet.
D— " " " grammar, " 18 by 10 "
E— " " " reading, second course, 19 by 10 feet.
F— " " " arithmetic, " 19 by 10 "
G— " " " geography, 18 by 10 feet.
H— " " " arithmetic, first course, 17 by 10 feet

a, a—Hot air entrances.
b, b, &c.—Ventilators, 3 feet diameter, in the upper ceilings of the rooms.
c, c—Desks.
d, d—Seats.
e, e—Settees.
f, f, &c.—Tables for teachers.
g, g—Platform, raised 8 inches above floor of rooms.
h, h—Recesses, containing books.
i, i—Seats occupying three sides of recitation rooms.

Description of Latin and English High Schools, Salem.

The interior of this building is fitted up in a style of ornamental and useful elegance which has no parrallel in this country.

The Latin School is believed to be the first Free School established in the United States, and probably in the world, where *every person* within certain geographical limits, and possessing certain requisites of study, has an equal right of admission, free of cost. It was founded in 1637, and has continued without interruption, giving a thorough preparation to students for college, to the present day. The English High School was established in 1827.

The walls of the Latin Grammar School are enriched and adorned with inscriptions in the Greek and Latin language and character. These are not merely apothegms of wisdom, but mementoes of duty; they are fitted to inspire the pupils with noble sentiments, and are the appropriate "*Genius of the Place.*"

The interior of the English High School is adorned in a manner no less appropriate and useful.

In the center of the ceiling is the circle of the zodiac, 29 feet in diameter. The ventilator, 3½ feet in diameter, represents the sun, the spots being designated upon the nucleus in conformity to the latest telescopic observation. The divergence of the solar rays is also fully exhibited. The earth is represented in four different positions, indicating the four seasons. The moon also is described in its orbit, and its position so varied as to exhibit its four principal changes. The globular figure of the earth is clearly shown, and lines are inscribed upon it representing the equator, tropics, and polar circles. The hour lines are also marked and numbered. The border of the circle represents upon its outer edge the signs of the zodiac, with their names, and within, the names of the months. The signs are divided into degrees, and the months into days, both of which are numbered. The thirty-two points of the compass are marked upon the inner edge, the true north and magnetic north both correctly indicated,—the variation of the needle having been ascertained by a recent series of observations.

The circle of the zodiac, as thus described, being enclosed within a square panel, the exterior spaces in the four angles are filled up as follows:

The western angle exhibits the planet Saturn, with his rings and belts, as seen through a telescope, and his true size in proportion to the sun, supposing the circle of the zodiac to represent the size of the sun. The eastern angle exhibits Jupiter, with his belts, of a size similarly proportionate. The other primary planets and the moon are described according to their relative sizes, in the southern angle. In the northern angle is a succession of figures, designed to represent the varying apparent size of the sun, as seen from the different planets. In the ceiling there are also two oblong panels, one towards the western, the other towards the eastern extremity. The western panel contains a diagram, which illustrates, by their relative position, the distance of the several planets, primary and secondary, from the sun, which is placed at one end of the panel. The several planets are designated by their signs, and the figures, placed opposite to each, show how many millions of miles it is distant from the sun. The satellites of the Earth, Jupiter, Saturn, and Herschel, are described as revolving in their orbits around their respective primaries. The eastern panel contains a diagram, which illustrates the theory of the solar and lunar eclipses. The moon is represented in different parts of the earth's shadow, and also directly between the earth and the sun.

Upon the four sides of the room, in the space above the windows and doors, eight panels are described, containing as many diagrams, which illustrate successively the following subjects:—

1. The different phases of the moon. 2. The apparent, direct, and retrograde motions of Mercury and Venus. 3. The moon's parallax. 4. The commencement, progress, and termination of a solar eclipse. 5. The diminution of the intensity of light, and the force of attraction in proportion to the increase of the squares of distance. 6. The transit of Venus over the sun's disc. 7. The refraction of the rays of light by the atmosphere, causing the sun, or other celestial bodies, to appear above the horizon when actu-

ally below it. 8. The theory of the tides, giving distinct views of the full and neap tide, as caused by the change of position and the relative attraction of the sun and moon.

The two small panels over the entrance doors represent, respectively, the remarkable comets of 1680 and 1811, and the theory of cometary motion as described in the plates attached to Blunt's "Beauty of the Heavens."

The diagram in the large panel upon the north side of the recitation platform represents the relative height of the principal mountains and the relative length of the principal rivers on the globe. The mountains and rivers are all numbered, and scales of distance are attached, by which the heights and lengths can be readily ascertained. The relative elevation of particular countries, cities and other prominent places, the limits of perpetual snow, of various kinds of vegetation, &c., are distinctly exhibited. This diagram is a copy of that contained in Tanner's Atlas.

The diagram in the corresponding panel on the south side of the recitation platform represents a geological section, the various strata being systematically arranged and explained by an index.

The space between the windows upon the north and south sides of the room are occupied by inscriptions in which the diameter, hourly motion, sidereal period, and diurnal rotation of the several primary planets and the earth's moon, are separately stated, according to calculations furnished for the purpose by Professor Peirce, of Cambridge. The hourly motion and sidereal period of the four asteroids are also stated in corresponding inscriptions upon the western side. The diameter and rotation of the sun are inscribed upon the edge of the circular recess beneath the ventilator.

Over the frontispiece, which surmounts the recess upon the teacher's rostrum, is a beautifully executed scroll bearing the inscription,

"Order is Heaven's first Law."

This motto may be regarded as equally appropriate, whether viewed as explanatory of the celestial phenomena which are figured upon the walls, or as suggesting the principle which should guide the operations of the school.

The clock is placed within the recess, upon the wall of which the course of studies prescribed for the school, and arranged into two divisions, is conspicuously inscribed.

Many of the charity schools of Holland contain paintings of no inconsiderable excellence and value. In Germany, where every thing, (excepting war and military affairs,) is conducted on an inexpensive scale, the walls of the school-rooms were often adorned with cheap engravings and lithographs, of distinguished men, of birds, beasts, and fishes;—and, in many of them, a cabinet of natural history had been commenced. And throughout all Prussia and Saxony, a most delightful impression was left upon my mind by the character of the persons whose portraits were thus displayed. Almost without exception, they were likenesses of good men rather than of great ones,—frequently of distinguished educationists and benefactors of the young, whose countenances were radiant with the light of benevolence, and the very sight of which was a moral lesson to the susceptible hearts of children.

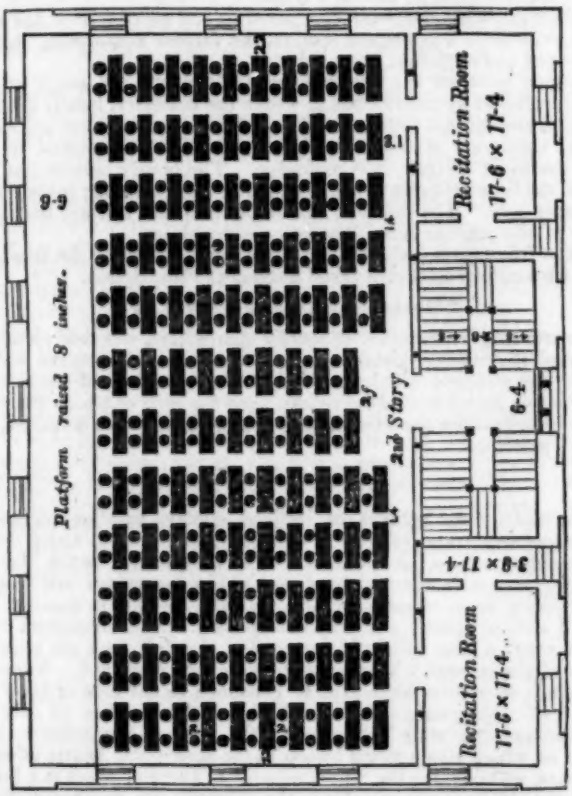
In the new building for the "poor school" at Leipsic, there is a large hall in which the children all assemble in the morning for devotional purposes. Over the teacher's desk, or pulpit, is a painting of Christ in the act of blessing little children. The design is appropriate and beautiful. Several most forlorn-looking, half-naked children stand before him. He stretches out his arms over them, and blesses them. The mother stands by with an expression of rejoicing, such as only a mother can feel. The little children look lovingly up into the face of the Saviour. Others stand around, awaiting his benediction. In the back-ground are aged men, who gaze upon the spectacle with mingled love for the children and reverence for their benefactor. Hovering above is a group of angels, hallowing the scene with their presence.—*Mr. Mann's Seventh Annual Report.*

PLANS, &c., OF BRIMMER GRAMMAR SCHOOL, BOSTON.

This building was erected in 1843. It is situated on Common-street, near Washington. It is 74 feet in length on the street, by 52 feet deep, with three stories. The entrance is in the center of the front into a hall 8 feet wide, leading through into the yard in the rear, which is divided by a wall into three portions. The passage to the second and third floors is by a double flight of stairs near the front door.

The first floor is occupied by two Primary School-rooms, each 30 by 22 feet, and 11 feet high; and the Ward-room, 30 by 50 feet.

The school-room on the *second floor* is 70 feet by 37 feet wide, and 14 feet 6 inches high between the bays. The ceiling is plastered up between the bays, (cross timbers) by which eighteen inches are grained in height, dividing the ceiling into equal compartments. There are two recitation rooms, one



on each side the entrance, 17 feet 6 inches, by 11 feet 4 inches each, with two windows in each room, and benches on all the sides for the pupils. The school-room is lighted on three sides, and contains 118 desks, and 236 chairs, two chairs to each desk, the desks and chairs being of four sizes. The tops of the desks are cherry wood, and the chairs are Wales' patent. The desks are separated by aisles one foot four inches in width, except the center aisle, which is two feet wide.

The aisles on the side nearest the recitation-rooms, are three feet wide, and those at each end, 2 feet 6 inches each. The platform on which are the desks of the master and assistants, is eight inches high, and 6 feet 6

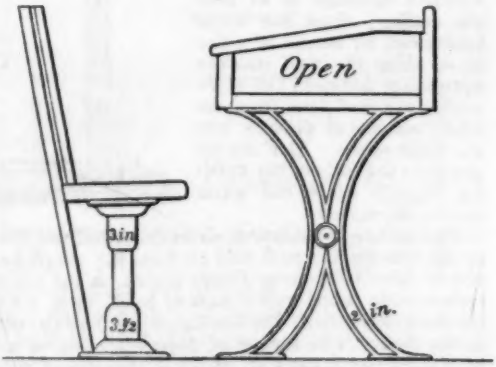
inches wide, and the desks are so placed *that the pupils sit with their backs to the platform;* and the pupils are so arranged at the desks in classes and sections, that when one class is reciting, the desk is only occupied by one pupil. The windows are shaded by inside blinds painted green.

The school-room on the *third floor* is of the same size, having an arched ceiling 13 feet high in the center, with recitation-rooms and other arrangements similar to the school-room on the second floor.

The building is warmed by two furnaces, and ventilated by six flues, discharging into the attic, from which the impure air is carried off by copper ventilators in the roof. The openings into the flues in the school-rooms are controlled by Preston's ventilators.

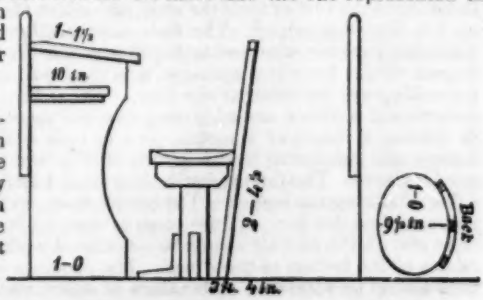
The frame of Preston's Ventilator is made of a flat bar of iron $2\frac{1}{2}$ by $\frac{1}{4}$ inch, framed at the corners, the end at each corner running by in order to receive a clamp to screw the frame to the brick work; the door is of plate iron, ($\frac{1}{16}$ wire gage), with a rod passing down the center of the plate, on the back side, each end of the rod running by the plate and entering the frame, forming a pivot on which the plate or door of the ventilator turns. The door shuts against a projection in the frame.

The chair in the accompanying section of a desk and seat, similar to those with which the new Latin High School in Bedford-street is furnished, is Wales' *Patent School chair*. The iron standard is one solid piece, having no joining to get loose, or come apart in the use. They are made of any height and size from 8 inches to 17 inches from the top surface of the seat to the floor, by S. Wales, jun., 66 Kilby-street, Boston.

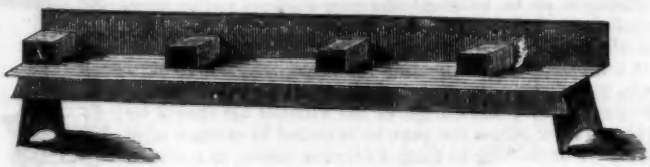


The standard of the desk, represented in the cut, is also cast iron.

The desks in the Brimmer School are more like the one represented in the accompanying section of desk and chair used in the Elliott Grammer School.

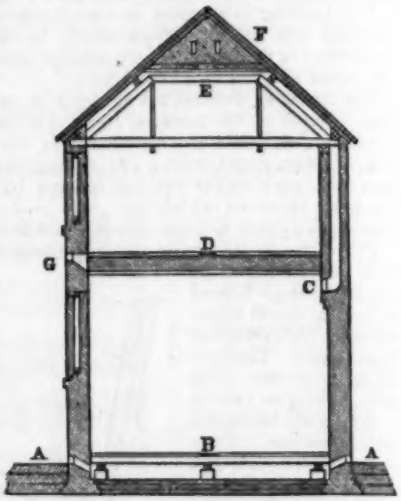


The cut below represents the bench used in the Primary School. The scholars are separated by a compartment A, which serves as a rest for the arm, and place of deposit for books.



Hints respecting Ventilation.

The annexed section exhibits the mode recommended in the "Minutes of the Committee of Council (England) on Education," for regulating a supply of fresh air, and providing for the escape of that rendered unfit for respiration in school-houses with two stories. A, A and G are gratings communicating by a passage through the external wall into a space under the floor, by which cold pure air enters at B and D through valvular openings in the floors into each apartment respectively. The extent of these openings can be enlarged or diminished or entirely closed at any time by turning the valve or register with which each opening should be furnished. At C and E the impure air can be allowed to escape through valvular openings in or near the ceiling; from the lower apartment, by means of a flue in or along the wall into the open space between the upper ceiling and roof; and from the upper apartment directly into the same space. At F are air grates in the ends of the building through which the warm impure air escapes.



The mode of ventilation, above described and illustrated, can be improved by introducing the pure cold air from the atmosphere above the building by one of *Mott's Receiving Cowls* placed on the top of a recess of four or six inches made in the wall if built of brick, or of a flue or pipe extending from the floor to the roof, and discharging it into the room by a valvular opening in the floor. The escape of impure air can be hastened by placing one or more of *Mott's Exhausting Cowls* on a ventilating flue or flues, leading directly from each apartment above the roof or from the attic, into which the impure air has been discharged. The flues or recess, both for introducing pure air, and discharging that which has become impure should have two openings into the room, one near the ceiling and the other at the floor. These flues can be constructed without any additional cost for mason work, by leaving a recess of 4 inches (in a 12 inch wall) by 20 inches, and continuing it through the coping on which the cowl is placed. The furring for the lath being 1 inch, leaves a flue of 100 square inches. The beams, floor, and ceiling will complete the flue. If the room is warmed by one or more stoves, the cold air should be introduced within a few inches of the bottom of the stove. The openings into the flues should be furnished with valves or doors, and should be managed so as to admit the pure cold air to the most heated part of the room, and effect the escape from that part of the room where the air is most impure. This will vary with the mode of heating the room, whether by fireplace, stove, or furnace; and from summer to winter. The openings for the escape of the vitiated air should be so placed as to cause the pure air warmed by contact with the stove, or flowing in from a furnace below, to traverse the whole apartment.

Receiving Cowl.

Exhausting Cowl.

Hints respecting Blackboards.

The upper portion of the standing blackboard should be inclined back a little from the perpendicular, and along the lower edge there should be a projection or trough to catch the particles detached from the chalk or crayon when in use, and a drawer to receive the sponge, cloth, lamb's-skin, or other soft article used in cleaning the surface of the board.

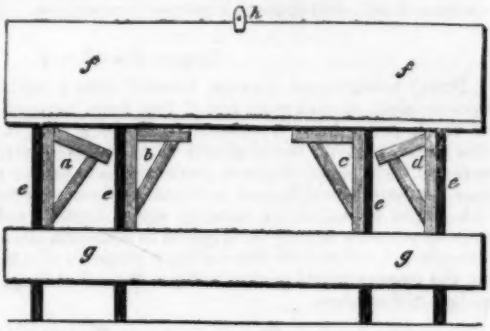
Blackboards, even when made with great care, and of the best seasoned materials, are liable to injury and defacement from warping, opening of seams, or splitting when exposed to the overheated atmosphere of school-rooms, unless they are set in a frame like a slate, or the panel of a door.

By the following ingenious, and cheap contrivance, a few feet of board can be converted into a table, a sloping desk, one or two blackboards, and a form or seat, and the whole folded up so as not to occupy a space more than five inches wide, and be easily moved from one room to another. It is equally well adapted to a school-room, class-room, library or nursery.

f f Under side of the swinging board, suspended by rule-joint hinges, when turned up, painted black or dark chocolate.

a d Folding brackets, inclined at an angle of 75 degrees, and swung out to support the board when a sloping desk is required.

b c Folding brackets to support the swinging board when a bench or flat table is required.



e e e e Uprights attached to the wall.

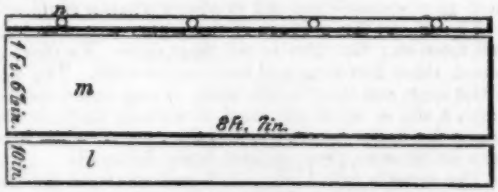
g g Form to be used when the swinging board is let down, and to be supported by folding legs. The under side can be used as a blackboard for small children.

h A wooden button to retain the swinging board when turned up for use as a blackboard.

n Opening to receive inkstands, and deposit for slate, pencil, chalk, &c.

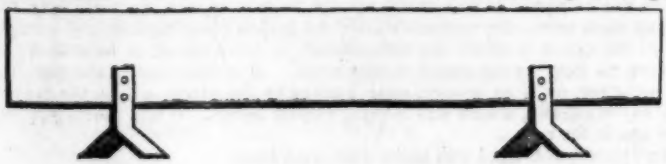
m Surface of swinging board when let down.

l Surface of form or bench.



When not in use, or let down, the desk and form should hang flush with each other.

A cheap movable blackboard can be made after the following cut (Fig. 3.



Slate Blackboard.

In the class-rooms of the American Asylum for the Deaf and Dumb, and all similar institutions, where most of the instruction is given by writing, and drawings on the blackboard, large slates from three feet wide, to four feet long are substituted for the blackboard. These slates cost from $2 to $3, and are superior to any other form of blackboard, and in a series of years prove more economical.

Plaster Blackboard.

As a substitute for the painted board, it is common to paint black a portion of the plastered wall when covered with hard finish, (i. e. plaster of Paris and sand;) or to color it by mixing with the hard finish a sufficient quantity of lamp-black, wet with alcohol, at the time of putting it on. The hard finish, colored in this way, can be put on to an old, as well as to a new surface. Unless the lamp-black is wet with alcohol, or sour beer, it will not mix uniformly with the hard finish, and when dry, the surface, instead of being a uniform black, will present a spotted appearance.

Canvas Blackboard.

Every teacher can provide himself with a portable blackboard made of canvas cloth, 3 feet wide and 6 feet long, covered with three or four coats of black paint, like Winchester's Writing Charts. One side might, like this chart, present the elements of the written characters classified in the order of their simplicity, and guide-marks to enable a child to determine with ease the height, width, and inclination of every letter. Below, on the same side, might be ruled the musical scale, leaving sufficient space to receive such characters as may be required to illustrate lessons in music. The opposite side can be used for the ordinary purposes of a blackboard. When rolled up, the canvas would occupy a space three feet long, and not more than three inches in diameter.

Directions for making Crayons.

A school, or the schools of a town, may be supplied with crayons very cheaply, made after the following directions given by Professor Turner of the American Asylum for the Deaf and Dumb.

Take 5 pounds of Paris White, 1 pound of Wheat Flour, wet with water, and knead it well, make it so stiff that it will not stick to the table, but not so stiff as to crumble and fall to pieces when it is rolled under the hand.

To *roll* out the crayons to the proper size, two boards are needed, *one*, to roll them *on*; the *other* to roll them *with*. The first should be a smooth pine board, three feet long, and nine inches wide. The other should also be pine, a foot long, and nine inches wide, having nailed on the under side, near each edge, a slip of wood one third of an inch thick, in order to raise it so much above the under board, as, that the crayon, when brought to its proper size, may lie between them without being flattened.

The mass is rolled into a ball, and slices are cut from one side of it about one third of an inch thick; these slices are again cut into strips about four inches long and one third of an inch wide, and rolled separately between these boards until smooth and round.

Near at hand, should be another board 3 feet long and 4 inches wide, across which each crayon, as it is made, should be laid so that the ends may project on each side—the crayons should be laid in close contact and straight. When the board is filled, the ends should be trimmed off so as to make the crayons as long as the width of the board. It is then laid in the sun, if in hot weather, or if in winter, near a stove or fire-place, where the crayons may dry gradually, which will require twelve hours. When thoroughly dry, they are fit for use.

An experienced hand will make 150 in an hour.

DIFFERENT KINDS OF BOOKS IN USE IN THE PUBLIC SCHOOLS.

In Spelling, Reading, Definitions, &c.

American First Class Book.
American Popular Lessons.
American Preceptor.
Angell's Union Series, No. 1.
" " " 2.
" " " 3.
" " " 4.
" " " 5.
" " " 6.
Bible and Testament.
Bumstead's First Reading Book.
" Second "
" Third "
Claggett's American Expositor.
Cobb's Spelling Book.
Cumming's Spelling Book.
Emerson's National Spelling Book.
" Introduction to Spelling Book.
Fowle's Common School Speller.
" Companion to "
Gallaudet's Child's Picture Defining Book.
Gallaudet's Practical Spelling Book.
" School Dictionary.
Hall's Primary Reader.
" Reader's Guide.
Hazen's Speller and Definer.
Historical Reader.
Lee's Spelling Book.
Murray's English Reader.
National Reader.
Parley's Common School History.
Porter's Rhetorical Reader.
Russell's Primer.
" Spelling Book.
" Primary Reader.
" Sequel.
" Introduction.
Russell's American School Reader.
" Elocutionary Reader for Young Ladies.
" Introduction to " "
" Lessons in Enunciation.
Town's Analysis.
Tower's Gradual Reader.
Webster's American Spelling Book.
" Elementary " "
" School Dictionary.
Worcester's First Book.
" Second "
" Introduction to Third Book.
" Third "
" Fourth Book.
" School Dictionary.
" Comprehensive Dictionary.

In Arithmetic.

Adams'.
Ainsworth's.
Colburn's First Lessons.
Coolidge's.
Daboll's.
" Improved.
Davies'.
Emerson's First Part.
" Second Part.
" Third "
Greenleaf's Mental.
" Introduction.
" National.
Olney's.
Pike's.
Smith's Practical.
" New.
White's.
Willard's.

In Geography.

Goodrich's National.
Huntington's.
Malte Brun's.
Mitchell's Outline Maps.
Mitchell's Primary.
" School Geography.
Morse's School Geography.
Olney's.
Parley's Primary.
Willard's Primary.
Woodbridge's Modern.

In Grammar.

Balch's.
Brown's Institutes.
Bullion's Practical Lessons.
" English Grammar.
Cutler's.
Farnum's.
Fisk's.
Murray's.
Greenleaf's.
Smith's.

In Composition.

Parker's Progressive Exercises.
" Aids to English Composition.

In History.

Goodrich's United States.
Hale's United States.
Keightley's.
Parley's Common School History.
Whelpley's Compend.
Worcester's.

In Penmanship and Drawing.

Columbian.
Cook's.
Holbrook's Drawing Cards.
Root's.
Winchester's.

In Book-keeping.

Colt's.
Harris'.
Preston's.

In Algebra.

Bourton's.
Colburn's.
Day's.
Davies'.
Sherwin's.
Tower's Intellectual.

In Surveying.

Flint's.

In Astronomy.

Blake's.
Burritt's Geography of the Heavens.
Kendall's Uranography.
Olmsted's.

In Natural Philosophy.

Blake's.
Comstock's.
Olmsted's.
Swift's.

In Mental and Moral Philosophy, &c

Abercombie's Moral Philosophy,
Good's Book of Nature.
Watts on the Mind.
Wayland's Practical Ethics.